Scientific American

AN ILLUSTRATED

JOURNAL OF ART, SCIENCE & MECHANICS

Vol. LXIII.

NEW-YORK

PUBLISHED BY MUNN & CO.

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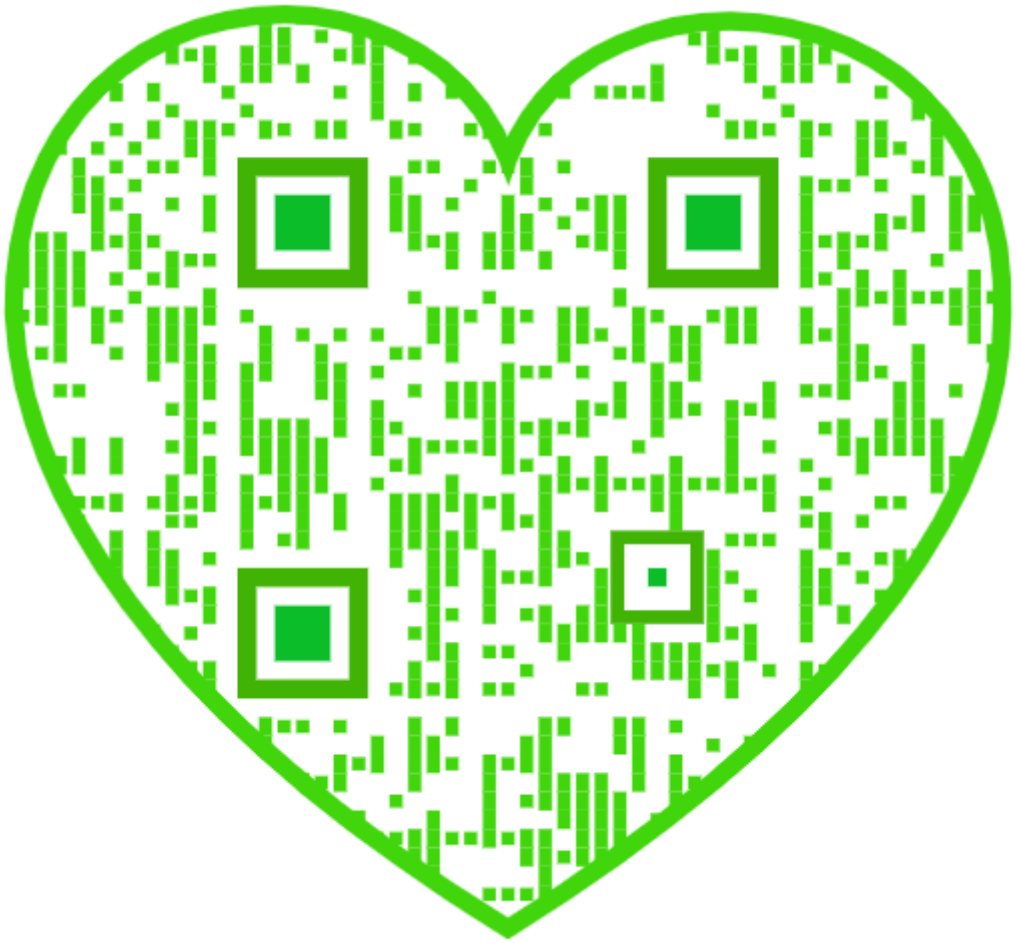

SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

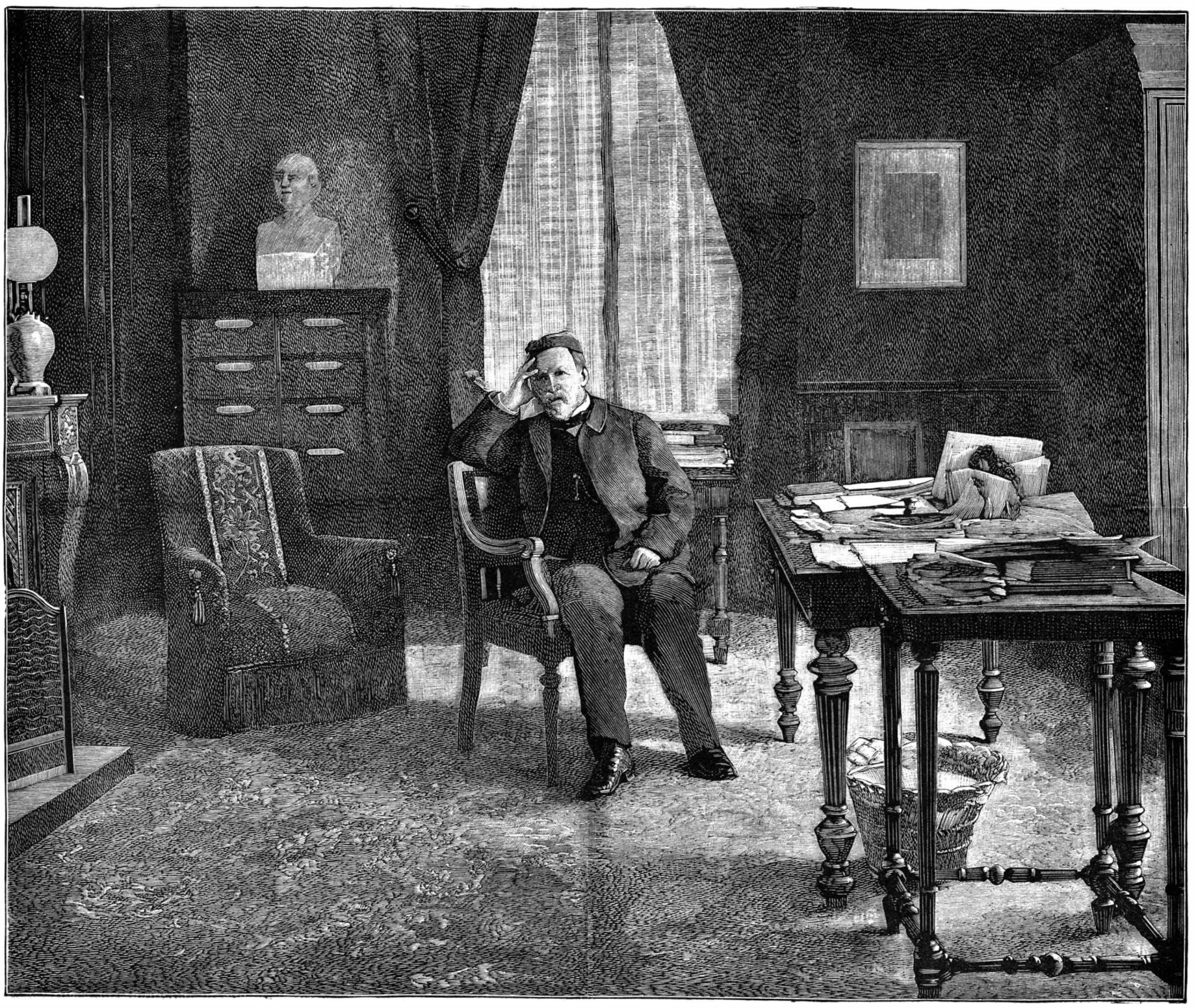
Vol. LXIII.—No. 1. ESTABLISHED 1845. NEW YORK, JULY 5, 1890. $3.00 A YEAR. WEEKLY.

M. PASTEUR.

In front of the Pasteur Institute, in Paris, is a bronze statue of a French shepherd boy engaged in a death struggle with a mad dog which had been worrying his sheep. With his bare hands, and with no weapon save his wooden sabot, the boy killed the dog, but was horribly bitten in the fight, and this statue represents an actual struggle which took place in October, 1885. The event gave the now famous French savant his first prominent opportunity of experimenting with his anti-rabic treatment upon a human being. The treatment was successful, and from that time to this many thousands of persons who have been bitten by rabid animals, of all countries and all stations in life, have been visitors to Pasteur's laboratory, to receive such treatment as would insure them, so far as human science could do so, against a horrible death. The French nation raised a monument to the discoverer of this anti-rabic treatment in the shape of the "Pasteur Institute," and there are now many similar institutions in various parts of the world, including one in New York City. Pasteur commenced his researches on rabies and hydrophobia in 1880, when little was known of the disease except that the virus was contained in the dog's saliva. He first proved by experiment that the disease was one localized in the nerve centers, finding that a portion of the matter of the spinal column of a rabid dog, when injected into a healthy one, causes rabies much more certainly and rapidly than does the injection of the saliva. This also explains the varying times of attack of the disease after a bite, the virus having to travel up the spinal cord before the symptoms can manifest themselves. The next problem was to weaken the virus, which proved a difficult and somewhat complicated task, as previous attempts to cultivate the special microbe of rabies outside the animal body had failed. But Pasteur's perseverance and method overcame the difficulty, and he succeeded in so far weakening the poison that in his hands it lost its virulent effects, while yet remaining potent enough to act as a preventive, so that dogs inoculated with this weakened virus might be bitten with impunity by mad dogs.

The Pasteur treatment has been virulently attacked because it has not always been successful; but this is something which has never been claimed for vaccination for any form of disease. It is estimated that from fifteen to twenty persons out of every hundred bitten by mad dogs or cats develop hydrophobia, but in 2,164 persons treated at the Pasteur Institute to January, 1887, there was a mortality of only 1·4 per cent, while in 1887 the mortality was reduced to 1·3 per cent, and in 1888 to 1·16 per cent. As touching this point, Sir Henry Roscoe says: "Pasteur's treatment is really a race between a strong and an attenuated virus. In cases in which the bite occurs near a nerve center, the fatal malady may outstrip the treatment in the race between life and death. If the weakened virus can act in time, it means life; if the strong virus acts first, prevention comes too late, and it means death. So that the treatment is not doubtful in all cases, but only in those which are under well known unfavorable conditions."

But it is not alone for his successful treatment and prevention of hydrophobia that M. Pasteur is entitled to a high place among the scientists and benefactors of the age. In 1857 he inaugurated researches on the action of the mould in the changes it effects on tartaric acid and the process of fermentation, which pointed the way to scientific improvements in brewing and wine making of the greatest value, and were said to be the stepping stones of the present science of bacteriology. He proved that the changes occurring in each of the various processes of fermentation are due to the presence and growth of a minute organism, that every peculiar fermentative change is accompanied by the presence of a special ferment, and this he proved by the most careful experimental inquiry, joined with the artificial cultivation of these organisms. In a visit to a large London brewery, in 1871, he explained by the use of a microscope the cause of a serious state of



M. PASTEUR IN HIS CABINET AT THE PASTEUR INSTITUTE, PARIS.

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things existing by which frequently as much as twenty per cent of the product was returned as unsalable, because the yeast had contained foreign or unhealthy organisms, and, largely from his suggestions, brewing has since become a series of precise and definite operations, capable of control at every point. Much in the same line were the investigations of Pasteur touching wine and its diseases, to the great advantage of the trade of France and other wine-producing countries.

Next in order of time came the investigations of Pasteur in relation to a plague which broke out among the silk worms in the South of France, on account of which the production of silk in that country had almost ceased in 1865. Pasteur plainly pointed out the cause of the trouble, and the means necessary for the alleviation of its effects and ultimate extermination, the latter, however, being an end which has not yet been reached. Other prominent examples of Pasteur's activity in a similar line, at once dependent on the character of microbes and their propagation, had reference to the chicken cholera in France, which he succeeded in practically annihilating, and another disease particularly fatal to cattle and sometimes to man, called splenic fever or wool sorters' disease. The latter plague had been fatal to millions of cattle, but since the adoption of Pasteur's method of inoculation for its prevention, it has now almost disappeared, and the agricultural insurance societies will not insure cattle unless they have been thus inoculated.

In a summary of the life work of Pasteur, delivered at Birmingham, England, in October of last year, Sir Henry E. Roscoe describes him as "a man devoted heart and soul to the investigation of nature, a type of the ideal man of science—whose example may stimulate even the feeblest to walk in his footsteps, if only for a short distance, whose life is a consistent endeavor to seek after truth, whose watchwords are simplicity, faithfulness, and industry, and whose sole ambition is to succeed in widening the pathway of knowledge, so that following generations of wayfarers may find their journeys lightened and their dangers lessened."

The Accident to the City of Paris.

The inquiry instituted by the London board of trade into the cause of the accident to the Inman line steamer City of Paris has been concluded, and, according to the verdict:

"The primary cause of the casualty was the extraordinary wearing down of the ring in the bracket supporting the extreme end of the propeller shaft, whereby the end dropped from its proper position about seven inches, thus producing a bending effect on the shaft at its forward support coexistent with each revolution of the engine. This probably produced a rupture of the external surfaces, gradually extending inward, and finally a total fracture. The cause of the water finding its way into the engine room and other compartments was that a large portion of the low pressure cylinder fell or was driven against the condenser, tearing it away and thereby opening a large communication with the sea, through which the water rushed in such volume that before any of the inlets could be closed they became covered with water and out of reach. The water passed into the dynamo room and port engine room through the bulkheads which were broken by the ruptured machinery, and into the two compartments by the injury to the valve box in the engine room."

The court suggested, as points worthy the consideration of naval architects and marine engineers, but not as intended in any way as an adverse comment upon the vessel, the invention of a governor to control marine engines in the case of similar breakdowns, the desirability of isolating each water-tight compartment as far as possible, and the improvement of the supports of the outboard bearings of long propeller shafts.

The Importance of a Good Specification.

The necessity of having an invention well described and every novel feature of the invention defined in both the drawings and specification preparatory to filing in the Patent Office was well set forth by the late Judge Grier, one of the more distinguished of the patent law judges of the Supreme Court of the United States, when he said, "There are few things more difficult, even for well educated and practical lawyers, than to describe a new invention clearly, and point out the principle which distinguishes the subject of it from all things known before. As inventors are rarely experts, either in philology or law, it has long been established as a rule that their writings are to be scanned with a good degree of charity. But it is easy to abuse this liberality to the purposes of fraud."

A BEET sugar manufactory, with a capacity of 400 tons a day, is said to be almost completed at Grand Island, Neb. The beet has sixteen per cent of sugar, and farmers realize $60 per acre at $4 per ton for the root. The diffusion process of extracting the saccharine principle is used. In a fourteen-battery circuit it is claimed that the remarkable result of 99·8 per cent of the sugar can be extracted.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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MUNN & CO., Publishers,
361 Broadway, New York.

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NEW YORK, SATURDAY, JULY 5, 1890.

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FIRE CRACKERS.

The stock of fire crackers in this country at the present time is said to be from twenty-five to thirty per cent less than is usual at this season. This shortage is due in part to labor strikes in China, where all the small crackers and most of the large or cannon crackers are made, and also to the imposition by the Chinese government of the *lekin*, or tax, both of which have acted as a check upon manufacturers. Strikes are of frequent occurrence in China, and laborers are thoroughly organized, having what are here called unions and guilds. Strikes are sometimes attended with loss of property as well as of life.

The annual receipts of fire crackers in this country are from eight hundred thousand to one million boxes, and orders for these goods have to be sent forward one year in advance. The Chinese manufacturing year begins June 1, and this is about the date when American merchants send forward their orders for next year's supply. The usual voyage from New York to Hong Kong is 120 days, so that there are only left, after a passage to China and return, 125 days of the year. The ship Wandering Jew arrived in New York on April 29 with 135,000 boxes of fire crackers on board, and she is the last ship which can arrive before the Fourth of July, the Great Admiral, now on the way, not being due until August 1.

It is, therefore, positively known that there will be a short supply of fire crackers, and this has had the effect of advancing the price from 80c. a box, which was paid last year, to $1.25 per box.

Crackers are made principally in Canton and in the country surrounding that city. A cannon cracker factory in the suburbs of Canton is described by an eye witness as follows:

The building is of sun-dried brick, with a tiled roof twelve feet from the ground, and this space is divided into an upper and lower apartment, each with the ceiling about six feet high. The interior of the building when visited was strewn with pieces of paper, while vessels containing powder were standing round, the contents of which seemed to be in imminent danger of being exploded, and men, women and children were actively engaged in the manufacture of the goods.

The paper needed for the cracker is cut to the required length and then weighed to see that the quantity for each cracker is exactly the same. The instrument used in weighing is of the rudest description, being a stick about two and one-half feet long, suspended from the ceiling by a string, which is attached to the center of the stick, and a stone is placed as a weight on one end and the articles to be weighed on the other. The paper is rolled into cylindrical form by means of a flat piece of wood held in the hands, and then one end is creased with a pair of pinchers and a string tied into the crease as a temporary means of preventing the powder from running out when the cylinders are placed in a perpendicular position to be loaded. The last named process is as follows:

The cylinders are bunched together like cigars turned on end, and then pinched with an awl, and into the aperture thus made the powder is poured from a tin can. Then the stem of the cracker is inserted, which consists of a piece of thin, tough paper, with just sufficient powder twisted up in it to make it burn quickly. A piece of paper is temporarily pasted over the end containing the stem for the purpose of preventing the powder from running out, as the crackers are now placed on that end.

The string placed temporarily around the pinched end is now removed and clay tamping is hammered into the aperture and then the paper is removed from the stem end and the clay tamping is applied there, which prevents any powder from sifting out.

The cracker is now ready for the thin piece of red paper which goes around the outside and completes it. The stems are then very neatly braided together, which forms the crackers into packs, and these are each wrapped in thin paper and ornamented with a red label with pictures of dragons upon it. Red is the festive color of China, and as fire crackers are used principally on festal occasions, that color is rigidly adhered to in the manufacture of these goods. The packs are placed in boxes and in the proportion of forty packs to the box. There is a regular division of labor in the cracker factory, each person having his or her special work to do, and in this they become very expert.

The above is a description of cannon cracker manufacture, but the same will apply to the small crackers. The latter, however, are generally made in the rural districts, and are brought down the river to Canton in junks.

There is a large home consumption of fire crackers, and the Chinese think that their explosion will ward off evil spirits. They are fired off on numerous occasions, but particularly on the Chinese new year, which is a variable date regulated by the changes in the moon. Foreigners residing at Canton have what they call the Canton salute, which consists in the firing off at one time of six boxes of small crackers and two or three boxes of cannon crackers, and this is given on the departure of some one of their number for home.

Of the million boxes of crackers sent each year to

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this country, a number are reshipped to South America, where they are used on social occasions as well as at public fetes. They are used in the south at Christmas time, and also in Canada on May 24, which is Queen Victoria's birthday. Cannon crackers are made in this country, but the small ones cannot be produced here at anything like the price they can be furnished by the Chinese. Their product is carried half way round the world, pays duty, and is then sold for 85 cents a box. In the McKinley tariff bill now before Congress, the duty on fire crackers is placed at 8 cents a pound, which will make the tax 63 cents as against 28 cents a box, which is the rate paid now. If this provision of the new tariff bill is adopted, it will probably have the effect of stimulating the manufacture of cannon crackers in this country.

Fire crackers are of very ancient origin. Dr. Williams in his exhaustive work on China, entitled "The Middle Kingdom," says: "No evidence exists of the use of gunpowder as an agent of warfare until the middle of the twelfth century, nor did a knowledge of its propulsive effects come to the Chinese until the reign of Yunglop in the fifteenth century—a thousand years after its first employment in fire crackers."

SPEED TRIAL OF THE CRUISER PHILADELPHIA.

The new cruiser Philadelphia, built for the government by Messrs. Cramp & Sons, at Philadelphia, has been so far completed as to be able to make her four hours' trial under steam, as required by the contract. By the terms of the latter the vessel was to be capable of making a mean speed of 19 knots per hour during a four hours' run at sea. If she made less, then the contractors were to forfeit $50,000 for each quarter knot below the standard. If she exceeded 19 knots, the contractors were to receive a premium of $50,000 for each quarter knot in excess of the standard.

The trial took place on the 25th of June, off the southeasterly end of Long Island, a measured course of forty miles having been marked out for the purpose. The conditions of sea, wind, and tide were as favorable as could be asked. According to all the accounts so far given, the trial was a complete success. It is believed the ship made an avergae of 19½ knots per hour, and earned a premium of $100,000 for her builders.

The Philadelphia is an unarmored cruiser of 4,324 tons. There are seven other ships of about the same size, but they are not all yet completed. It is not claimed that any of these vessels is able to fight a modern armored ship. The object in building these cruisers is to provide a fleet of fast vessels having speed enough to keep out of the way of ironclads and overhaul merchant vessels.

The contract price of the Philadelphia was $1,350,000 She was built from English designs, obtained by the Navy department several years ago, and though she is a good vessel, can hardly be said to represent the latest and best type of cruisers. Her construction was authorized and bids opened in 1887. It has taken not quite three years to build and put her on trial.

A full page engraving showing a portrait of the Philadelphia, and various details representing the mode of her construction, was given in the SCIENTIFIC AMERICAN of August 10, 1889.

How Diphtheria is Spread by Corpses.

Dr. Baker, the secretary of the Michigan State Board of Health, has issued a circular stating that in March two corpses, those of a woman and child of the same family, dead of throat disease, certified by the attending physician not to be "dangerous to the public health," were conveyed from Montmorency County to Lapeer County, Michigan, where in just a week from the day the coffins were opened and the remains viewed a person who was thus exposed came down with diphtheria. Many others, says Dr. Baker, would probably have been exposed except for the action of the local health officer, Dr. C. A. Wisner, who, suspecting that the cause of the deaths was diphtheria, warned the neighbors and forbade the opening of the coffins at the funeral. He promptly isolated the first person that was attacked, and no epidemic resulted. This, Dr. Baker adds, is quite different from the result of a similar occurrence at Zanesville, Ohio, last spring, where many deaths resulted from exposure to a corpse brought from Chicago. It shows the importance of notice to the local health officer of the arrival of a corpse, so that he may take every precaution that may be necessary.—*N. Y. Medical Journal.*

BIBLICAL units have the following equivalents: A shekel of gold was $8. A firkin was seven pints. A talent of gold was $13,809. A talent of silver was $538.30. Ezekiel's reed was nearly 11 feet. A cubit was nearly 22 inches. A bin was 1 gallon and 2 pints. A mite was less than a quarter of a glass. A shekel of silver was about 50 cents. A piece of silver, or a penny, was 13 cents. A Sabbath day's journey was about an English mile. An ephah, or bath, contains 7 gallons and 5 pints. A day's journey was about 23 1-5 miles. A hand's breadth is equal to 3⅝ inches. A finger's breadth is equal to 1 inch. A farthing was 7 cents.

Ants.

To the Editor of the Scientific American:

An India rubber tree was placed on the lawn of a house which has been inhabited several years. Till the tree was planted there no ants had been seen either inside or outside the house. Soon after locating the plant referred to, millions of ants appeared, and they have increased so rapidly that they have now become a formidable nuisance. No expense or trouble has been spared to get rid of these pests, the nuisance increasing rather than diminishing. The lawn has been resodded, but still swarms of ants infest the premises.

Can any of your numerous readers give me a remedy against this plague, and some information respecting the apparent partiality of these prolific insects for the India rubber plant? None of the adjacent lawns has been invaded, the ants confining themselves to the places on and near where the plant was placed.

C. T.

ANSWER BY PROF. C. V. RILEY.

It is difficult to answer intelligently Mr. Trench's communication in the absence of further particulars, and more especially as no specimens of the ant were forwarded for identification. If the ant is the common house ant (*Monomorinus pharaonis*), it is safe to say that there is no connection between the India rubber tree and the prevalence of the insect in and about the house, except perhaps that a colony of the ants was between the roots of the tree when this was transplanted, and that the ants thus became colonized in the vicinity of the house. If the ants belong to some other species, and if it be correct that they were not present before the planting of the tree, the ants are, in all probability, attracted by plant lice or scale insects which infest the tree. In this case the nuisance could be easily abated by killing the plant lice, which is best done by spraying with diluted kerosene emulsion or strong soap suds. The destruction of the house ants, if these have once fairly established themselves in a particular locality, is much more difficult, and I cannot do better than to quote here a passage from a recent paper by myself on household pests, originally published in "Good Housekeeping," May 25, 1889, and reprinted in "Insect Life," vol. ii, No. 4, October, 1889, pp. 106–108:

THE LITTLE RED ANT.
(*Monomorium pharaonis* L.)

The "red ant," as this insect is almost universally called, is another of the household pests which we owe to the older civilization of Europe, and, like other domestic pests, it has become almost cosmopolitan. It has been generally considered of North American origin and as one of the few American species which has become widespread in Europe. It is often confounded in the literature of the subject with *Myrmica molesta* Say, which is, however, a synonym. In the larger cities of Europe it is as much of a pest to-day as it is in this country. It probably received the scientific name of "Pharoah's ant" on account of a defective knowledge of Scripture on the part of its describer, who doubtless imagined that ants formed one of the plagues of Egypt in the time of Pharaoh, whereas the only entomological plagues mentioned were lice, flies, and locusts.

Ordinarily in households this insect is not a nuisance from the actual loss which it causes by consuming food products, but from its inordinate faculty of getting into things. It is attracted by almost everything in the house, from sugar to shoe polish, and from bath sponges to dead cockroaches. It seems to breed with enormous fecundity, and the incidental killing off of a thousand or so has little effect upon the apparent number. A house badly infested with these creatures is almost uninhabitable. They form their nests in almost any secluded spot, between the walls or under the floors or behind the base boards, or among the trash in some old box or trunk, or in the lawn or garden walk just outside the door. In each of these nests several females will be found, each laying her hundreds of eggs and attended by a retinue of workers caring for the larvæ and starting out from dawn till dark on foraging expeditions in long single files like Indians on the war path.

Our first recommendation is to find the point from which they all come. They may have built the nest in some accessible spot, in which case a little kerosene will end a large part, if not all, of the trouble. If the nest is in the wall or under the floor, and taking up a board will not bring it within reach, find the nearest accessible point and devote your energies to killing the ants off as they appear. Where the nests are outside nothing is easier than to find them and to destroy the inhabitants with kerosene or bisulphide of carbon. The nests are almost always in the immediate vicinity of the house. The ants are peculiarly susceptible to the action of pyrethrum in any form, be it Persian or Dalmatian powder or buhach, and a free and persistent use of this powder will accomplish much.

A great number of remedies have been proposed in the household columns of various journals, but nearly all depend upon the use of a mixture of some sort for trapping the ants, and at the best are slow and tedious means of warfare. The best of these with which I have had any experience consists in placing small bits of sponge moistened with sweetened water in the spots where the ants most do congregate, collecting the sponges once a day or so, soaking them in hot water and then replacing them. Small bits of bread and poisoned molasses or small vessels of lard in which a few drops of oxalic acid have been put have also been recommended, as well as the free use of borax, so often advised for roaches. The people of the Southern States suffer more from these pests than we do at the North, and a Floridian of experience (Mr. C. G. Cone, of Crescent City) recommends a mixture of borax and sugar, well mixed with boiling water, and left here and there on bits of broken crockery. If any one tries this, I should be glad to know the result. A much larger black or brownish ant (*Camponotus herculeanus* var. *pennsylvanicus*) often builds its nests in door-yards so close to the houses that it becomes a great nuisance, overrunning the rooms, and even getting into the clothes, so as to be a personal discomfort. A case was brought to my notice two years ago in Washington, where a fine old homestead was on the point of being sold on account of the annoyance caused by these ants. An investigation showed one enormous nest several feet in diameter in the back yard, and several colonies here and there in other parts of the premises. The large colony was completely destroyed by the use of bisulphide of carbon. A teaspoonful was poured down each of a number of openings, and a damp blanket was thrown over them for a few minutes. Then the blanket being removed, the bisulphide was exploded at the mouth of each hole by means of a light at the end of a pole. The slight explosions drove the poisonous fumes down through the underground tunnels, killing off the ants in enormous numbers. The main source of the trouble being thus destroyed, the nuisance was greatly lessened, and all talk of selling the old place has ceased.

Washington, D. C., June 19, 1890.

Electrical Exhibit at the Brooklyn Institute.

The first annual exhibit of the electrical department of the Brooklyn Institute occurred on the evening of June 21. There were about twenty exhibitors, some of whom had a number of exhibits, so that the hall was fairly well filled with electrical machinery and appliances.

The Edison Electric Lighting Co., of Brooklyn, exhibited a miniature electric lighting plant, showing the three-wire system complete in full operation. Samples of conduits, connections, and other details of the Edison system were also to be seen.

The Perret electric motor was shown in several forms. The Excelsior Electric Light Co., of New York (works in Brooklyn), exhibited a 3 horse arc light motor running a 50 incandescent light dynamo and a 1 H. P. motor. This exhibit illustrated the conversion of a high tension current to a low tension, by the use of a motor and a secondary dynamo. The arc light motor is provided with a very efficient governor, which maintained a uniform speed throughout the evening.

Mr. James Jones, Jr., of the firm of Pearce & Jones, N. Y., exhibited apparatus used in the fire alarm system. This apparatus clearly illustrated the working of this system.

Dr. J. F. Watts showed an improved battery based on the invention of Smee. This new battery is very constant, cleanly and easily managed.

Mr. J. P. Wintringham exhibited apparatus for use in static electricity.

Professor W. C. Peckham had a very interesting exhibit showing the action of a magnet on an electric current. A tinsel cord carrying a current was made to wind itself around a permanent bar magnet, first in one direction and then in the other, by changing the direction of the current. A novel and original experiment shown by Professor Peckham consisted in a suspended disk bearing a series of small bar magnets which were made to revolve around a conductor carrying a heavy current.

Professor P. H. Vanderweyde exhibited and explained several instruments from the large collection recently presented by him to the Institute.

Mr. J. H. Sharpe showed electric gas lighting apparatus in full operation, also a meter gauge for measuring resistances.

Mr. George M. Hopkins exhibited two forms of electrical gyroscope and two forms of Hughes induction balance.

This brief mention does not exhaust the list of interesting apparatus shown on this occasion. The exhibition was very successful, and creditable to those having the matter in charge.

THE State Land Commissioners of New York have granted the applications of the parties interested for river tunnels, namely, the Hudson River Tunnel Railway Company, now in process of construction, for right of way in New York, and the Long Island Railroad Company for right of way in New York for a tunnel to extend under the East River. The commissioners will now appraise the value of the right of way

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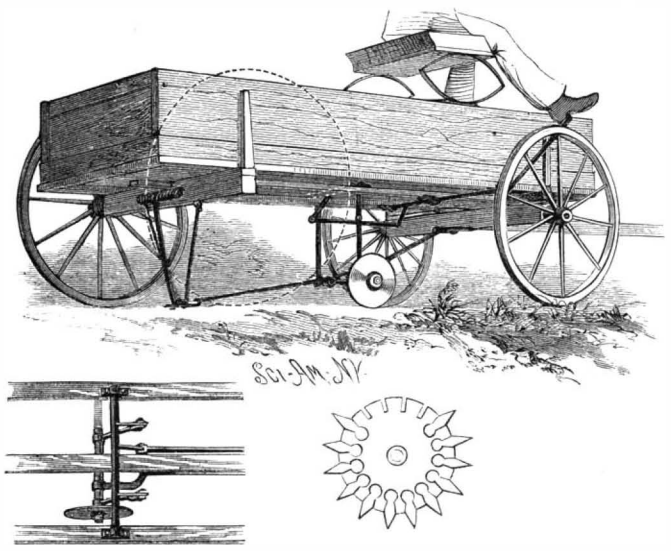
AN IMPROVED WAGON BRAKE.

The brake shown in the illustration does not operate upon the wheel tires, and is designed to effectually stop a vehicle in the middle of the steepest hill. It has been patented by Mr. Nathan A. Wheeler, of Alpowa, Washington. Suspended beneath the wagon body is a friction disk of metal, fixed to an axle which turns in stirrups pivotally attached at their upper ends to cranks projecting from a transverse shaft, which turns in boxes supported by main longitudinal girders, one of the small figures being an inverted plan view, showing the manner in which the friction disk is suspended from the wagon body. The stirrups may be attached to the cranks at different points, thus changing the length of the connection between the friction disk and the transverse shaft. The disk and its axle are braced by a bar extending forward to a connection with the lower side of the front axle, but such connection does not interfere with the vertical movement of the disk, which is raised and lowered by a connecting rod and brake lever. The connecting rod is pivotally attached at its rear end to a projecting crank of the transverse shaft, and at its forward end to a crank of the brake lever, which at one end is bent up at the side of the wagon body to be easily reached by the foot of the driver, a spring on the brake lever normally holding the disk out of contact with the ground. Attached to the disk axle is a chain connected to a rearwardly extending brake rod, the brake shoe of which is suspended by rods pivotally attached to the rear axle, a spring normally holding this brake shoe in elevated position. As the driver moves the brake lever forward and downward, pressing his foot down upon the treadle, the friction disk strikes the ground, and the motion of its axle winds the chain to pull the rear brake rod forward, and cause its shoe to swing downwardly to the ground, where it will act as a drag. By increasing the pressure, the friction disk is forced more firmly upon the ground, when the rear brake shoe may be brought forward sufficiently to lift the rear wheels of the wagon. In one of the small views is shown a toothed disk, which may be substituted for the friction disk when the roads are frozen and icy.



WHEELER'S WAGON BRAKE.

SWIFT'S DOUBLE ACTION AND HAMMERLESS REVOLVERS.

The two revolvers illustrated herewith contain new features, and are made of the best materials and finely finished. In Fig. 1 the most important improvement consists of the barrel catch resting firmly on the hammer when the pistol is discharged. As the barrel can be thrown open only by pressing down on the catch, it is utterly impossible for it to be opened when obstructed by the hammer. This absolutely prevents the danger of the barrel opening when the revolver is discharged, an improvement heretofore deemed unavailable in automatic shell-ejecting revolvers.

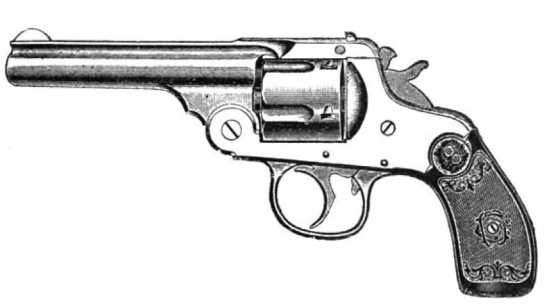


Fig. 1.—SWIFT DOUBLE ACTION AUTOMATIC REVOLVER.

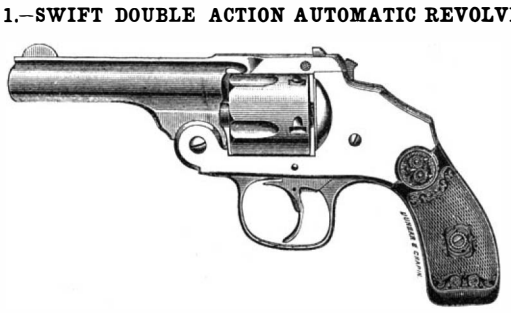
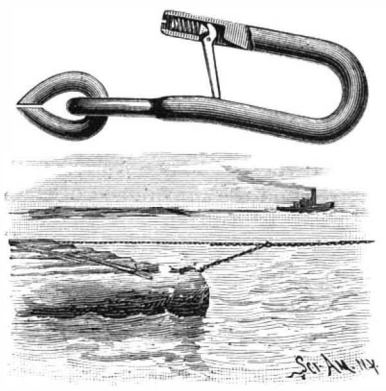


Fig. 2.—SWIFT SAFETY HAMMERLESS AUTOMATIC REVOLVER.

In Fig. 2 the safety attachment used in the double action revolver is also found. There is also attached a safety device to the trigger, so that the weapon cannot be discharged except when held in the hand in the usual manner. By means of this improvement the revolver can be kept loaded with safety, and will not be discharged either by being dropped or while carried in the pocket. These goods are manufactured by the John P. Lovell Arms Company, Boston, Mass., who will gladly furnish additional particulars to those interested.

AN IMPROVED SNAP HOOK.

The snap hook shown herewith is designed more particularly for use on vessels, and especially in towing rafts of logs, for which, ordinarily, a very heavy hook is employed, which requires to be tied to keep it from falling out of the ring in the boom chain. The invention has been patented by Mr. Nels Nelson, of Aberdeen, Washington. The latch, which is somewhat crooked and angular in shape, is pivoted in the nose portion of the hook, and is fitted to work within a slot that opens from the interior, and is in communication with a longitudinal recess opening through the outer extremity of the nose. In this recess is a spiral spring, carrying at its free end a swivel stud or cone, which bears against an inner stepped end of the latch, the opposite end of the spring resting upon a centering screw plug that closes the outer end of the aperture, the spring being thus free to adjust itself in all directions.



NELSON'S SNAP HOOK.

AN IMPROVED REIN HOLDER.

A device designed to prevent runaways when horses attached to vehicles are left unattended, and especially adapted for application to all kinds of delivery and express wagons, as well as buggies, etc., is represented in the accompanying illustration. A transverse shaft is journaled on the rear of the front axle, as shown in the sectional view, a gear wheel on the outer end of this shaft meshing with a gear wheel on the hub, such gear having a cover to keep out dust and dirt. On the inner end of this shaft is a stationary half clutch, keyed to the shaft, and a movable half clutch, these clutches being normally held apart by a spiral spring, and upon the movable half clutch is a drum, a strap connected to which passes through a hole in the bottom of the wagon body up through a tube on the inside of the dashboard, as shown in one of the views, to attachment with one of a pair of clamps which are spring-supported in the upper portion of the tube. The spring support is designed to impart a gentle pressure to the clamps, whereby they are held frictionally in any desired position. At the side of the tube on the inside of the dashboard is mounted a vertical rod having a handle at its upper end, while connected to its lower end is a cord passing over pulleys beneath the wagon body to engagement with a cam so supported as to be adapted to bear against a side flange of the movable half clutch. The connection of the cord with the rod is made through a short spiral spring, to give a yielding contact in case the teeth of the clutch should meet at their points and not lock together, the starting of the horse then effecting the locking of the clutch. To hitch the horse the reins are engaged between the clamps, which stand normally at the upper end of the tube on the inside of the dashboard, and the rod at the side is elevated, the latter motion, by means of the cam mechanism, engaging the two half clutches. The turning of the front wheel, from the starting of the horse, will now rotate the transverse shaft, drawing the clamps down the tube, whereby the bit will be drawn tightly into the horse's mouth. To release the device, a slight blow is given to the handle at the top of the vertical rod, which permits the cam to turn, when the half clutches are automatically forced apart by the spiral spring to their normal position. The reins are provided with small flat buttons or stays to prevent their slipping through the clamps when wet.

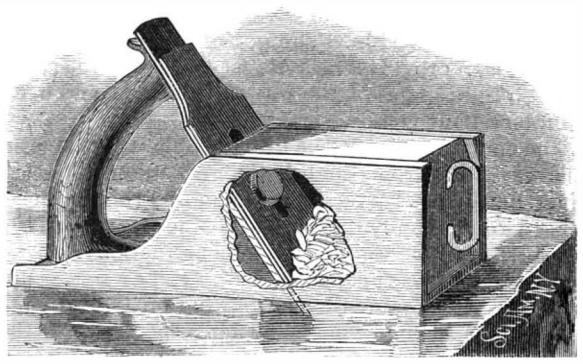
For further information relative to this invention address the patentee, Mr. William E. Ross, No. 155 Jay Street, Rochester, N. Y.

Capsicum as a Counter-irritant.

Dr. Henry J. Buck, writing to the *Lancet*, says: "I have used this drug for more than twenty years—I may almost say daily—and many of my patients will not travel without a bottle of the 'magic lotion,' as they call it. I find the simplest and most efficacious way of applying it is to soak a large handful of the crushed pods in half a pint of hot water for an hour, then strain, and bottle for use. A teaspoonful of eau-de-cologne added will help to keep the solution, or it can be well boiled after preparing. I then have it applied to the affected parts on a piece of linen folded three or four times, or on lint, and covered with gutta percha tissue or a dry flannel. In this way the lotion may be kept on for hours without vesicating, and in many cases the skin is hardly reddened. The stinging and burning sensation produced by the capsicum lotion is, after a few minutes, welcomed by the sufferer, so magically does it often remove the rheumatic or neuralgic pain for which it is being applied. In acute torticollis a cure is often speedily obtained by covering the side affected with the application. In any form of neuralgia, rheumatism, subacute gout, pleurodynia, and such like, it will be found most useful, and may be reapplied over and over again during the day and night without any fear of vesication."

AN IMPROVED ICE PLANE.

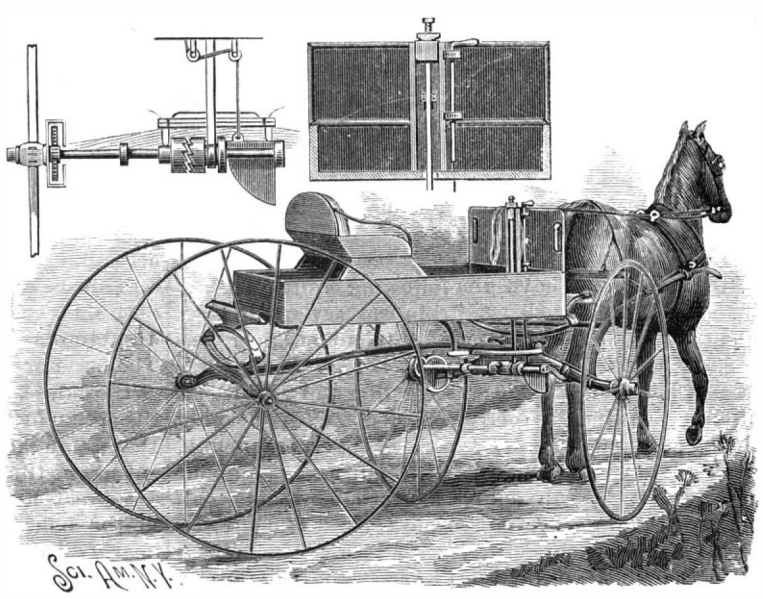
The accompanying illustration represents a simple and convenient implement with which blocks of ice may be shaved, as desired in making mixed iced drinks, the shaved ice passing upward into a box which may be withdrawn from the implement for convenience in placing the shaved ice in goblets or glasses, etc. The form of the plane stock does not differ essentially from an ordinary wood plane, and upright walls integral with the base plate extend up on each side thereof. These walls preferably slope inwardly on their inner sides, above a certain height, thereby constituting a retaining shoe for the convenient introduction and retention of a box with an inner open end, with inclined walls, adapted to fit neatly against the adjacent face of the throat plate of the plane. The box is preferably made of tinned or galvanized metal, to prevent rusting, and has a handle attached to its end wall to facilitate its insertion or removal from its position in the stock.



FAUGHENDER'S ICE PLANE.

For further information relative to this invention address Messrs. Faughender & Crusoe, Piedmont, Ala.

KRUPP'S largest gun of cast steel weighs 135 tons, and the barrel is 40 ft. long. Its caliber is 13½ in. The gun has been sent from the works at Essen to Cronstadt.



ROSS' REIN HOLDER.

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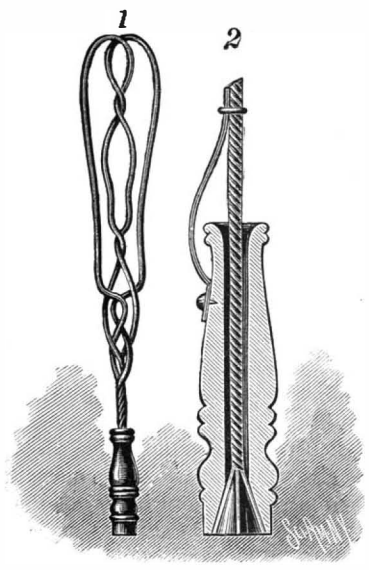
A NEAT AND EFFECTIVE CLOTHES BEATER.

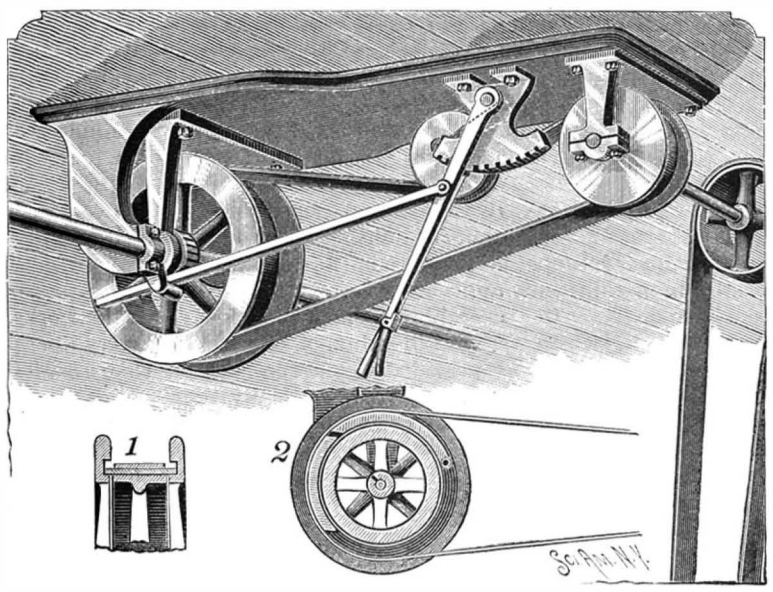
The illustration represents a light and simple device for switching or beating clothes, carpets, etc., which has been patented by Mr. Matthew Fitzpatrick, of Omaha, Neb. The beating portion of the implement is composed of two spring metal wires, bent and intertwined to form loops, as shown in Fig. 1. Near the handle portion the wires are twisted or braided to form a single body sufficiently long for insertion into the handle, shown in section, Fig. 2, and having a longitudinal aperture of a diameter greater than the twisted portion of the wires. The rear portion of the handle aperture is made flaring, whereby a plug may be inserted and driven to place between the separated inner ends of the wires to firmly fasten the beater portion to the handle. To assist in holding the wires in place and impart to them additional elasticity, a flat spring is held at one end by a screw or rivet to the handle and is attached to all the wires at its other end, near the point where the loop portion of the beater commences.



FITZPATRICK'S CLOTHES BEATER.

AN IMPROVED TENSION DEVICE FOR BELTS.

A device for attachment to any driving pulley, to dispense with the necessity of loose pulleys, and the use of a shifter in contact with the belt, is shown in the accompanying illustration, and has been patented by Mr. Anders G. Anderson, of Nestocton, Oregon. Fig. 2 shows a section through the drive wheel, and Fig. 1 represents the application on its periphery of a fender corresponding to about one-third of its circumference, this fender tying together disks loosely mounted upon the drive shaft at each side of the drive wheel. There is also a movable semicircular fender capable of sliding in the disks and upon the fixed fender, in connection with a friction pulley adapted for contact with the belt of the drive pulley, a lever being secured to the hanger of this pulley, with a pinion and rack attachment. To stop the revolution of the countershaft, the lever is thrown in the direction of the drive pulley, as shown in the illustration, throwing the hanger downward to such an extent as to elongate the belt. This movement of the lever also pushes forward a rod pivoted on the lever having rack teeth, which causes the disks at either side of the drive wheel to make a partial revolution, causing the two fenders to form a shield covering two-thirds of the drive pulley, whereby the belt is held out of engagement therewith.



ANDERSON'S TENSION DEVICE FOR BELTS.

RIFE'S AUTOMATIC HYDRAULIC ENGINE.

This engine (or ram) is very simple in its construction, and is designed to be kept in order at little or no expense. It is self-operating and constant in its action and has performed good work for elevating a continuous supply of water for irrigation, small towns, railroad tanks, factories, country residences, stock yards, etc. The engraving represents the size known as No. 30, weighing 250 pounds, and fitted for 3 inch drive pipe and 1¼ inch discharge pipe. One inch discharge pipe can be used where circumstances favor it.

On account of the raised base an automatic air feeder is drilled in the elevated base; this does away with taking off the air chamber to exhaust the air, which has to be done, when the old style is used, as often as once a month.

When working at full capacity, under an average fall of four to seven feet, the ram uses from 30 to 35 gallons per minute, but it is easily regulated to suit the flow from spring or stream to fifteen gallons per minute if necessary. Many of this kind are at work under various conditions, the fall on the ram varying from 15 inches to 15 feet, and forcing water from 15 to 250 feet high, and in some places to a distance exceeding one mile. For every foot fall this ram will elevate water twenty feet.

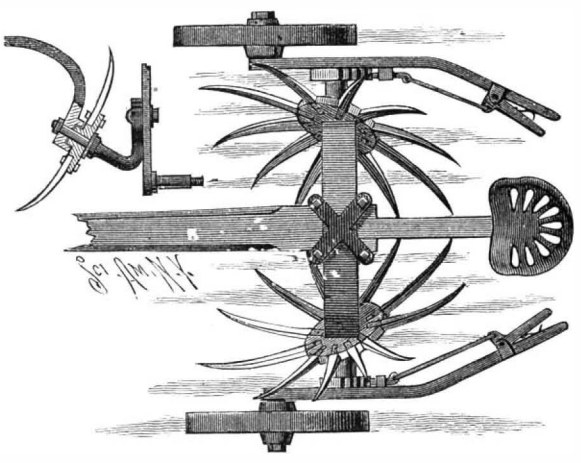
In Fig. 2 is shown the construction of the hydraulic engine, the air chamber being removed. The lower section or base is clearly shown, as well as the double-acting attachments, and how connected for properly delivering the spring water into the ram so that it may be forced, in a pure condition, by the power of the creek or river water, to any desired place. The spring water is conducted through the spring supply pipe, M, and check valve, O (which prevents its return), and is delivered into the base, B, directly under the delivery valve, which being removed shows the open end of the pipe from which the spring water flows, filling the entire elevated portion of the base with spring water, down to the place where the creek or river water discharges through the escape valve; so that when this valve closes, the entire force of the moving column of creek or river water through the drain pipe is exerted upon the spring water, driving a portion through the delivery valve into the air chamber, J, and is discharged through the pipe, P, to any required place. When the creek or river water has expended its force and recoils, a new supply of spring water promptly follows, replacing the portion just driven into the air chamber ready to be forced by the repeated action of the creek or river water.

The spring supply pipe, M, is provided with an overflow pipe, N, through which the spring water may momentarily escape when the check valve is closed, preventing any check or stoppage in the flow from the spring, being always ready to enter the ram and promptly follow the creek or river water the moment it recedes.

Additional particulars and an illustrated catalogue will be furnished free of charge by addressing Rife's Hydraulic Engine Manufacturing Co., Roanoke, Va., who are the sole owners and manufacturers.

AN IMPROVED POTATO DIGGER.

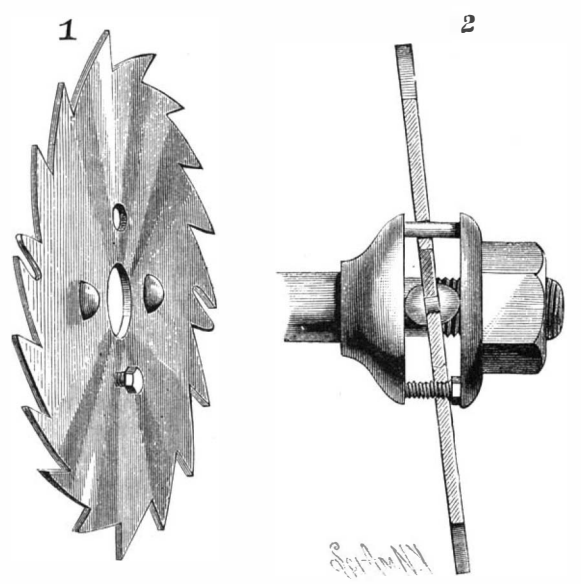
The illustration shows a plan view of a machine for digging potatoes and other vegetables, in which rotary forks are employed having radial tines adapted to occupy oblique positions in upward directions away from each other, while capable of being adjusted vertically. It is a patented invention of Mr. Charles H. Ayres, of Hightstown, N. J. The central portion of the frame is a saddle-like structure, secured by a clip to the draught beam, and united at its lower end on each side with a cranked arm, the inner end of each of which forms a pivot or axle for the rotary forks to turn upon, while their outer upturned ends have pivoted to them levers by which the main frame is raised or lowered to adjust the forks. The forward ends of these levers carry the axles upon which the running wheels turn. The small figure shows a partial sectional elevation of one side of the machine, illustrating its raising and lowering lever. The forks are thus adjustable also in backward directions toward each other, to gradually dig into the row from opposite sides and approach or come together in the rear, thus causing them to act as diggers and lifters and cleaners of the potatoes, and making the whole machine complete as a plow, without the aid of cultivator teeth in advance to break up the ground ahead of the forks.



AYRES' POTATO DIGGER.

AN IMPROVED WABBLE SAW.

The illustration represents a simple and efficient device by means of which the angle of the saw may be quickly changed and fixed. It is a patented invention of Mr. Lewis B. Rogers, of Mount Vernon, N. Y. Fig. 1 shows one side of a saw adapted for such



ROGERS' WABBLE SAW.

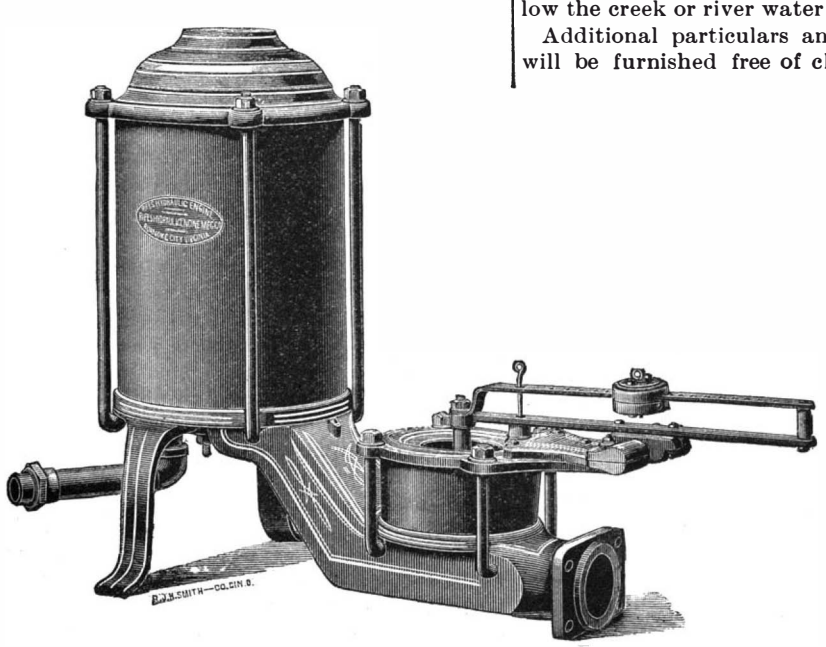


Fig. 1.—RIFE'S AUTOMATIC HYDRAULIC ENGINE.

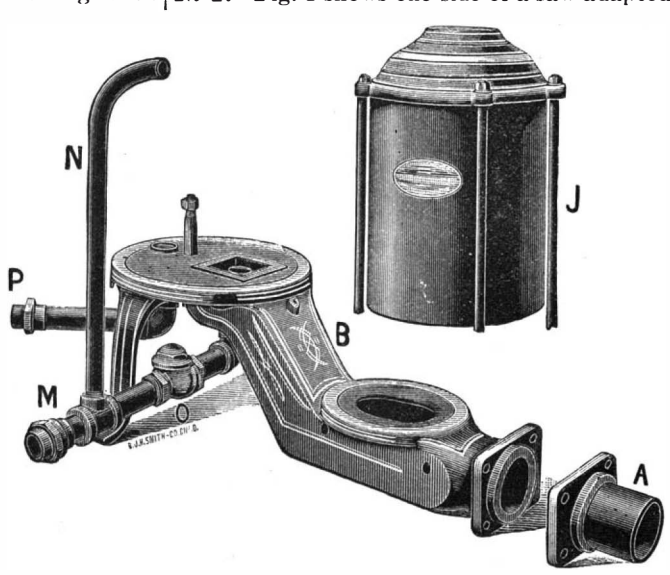


Fig. 2. RIFE'S HYDRAULIC ENGINE DISCONNECTED TO SHOW CONSTRUCTION.

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use, and Fig. 2 is a vertical cross section of the saw mounted upon a mandrel between two collars. The mandrel has a screw thread which extends nearly to the saw, with an outside washer or collar, and a nut to hold the latter in position. Fixed in the saw plate on each side, or integral therewith, are projecting knobs adapted to bear against the collar and the washer near their outer edges, these knobs being opposite to each other, and acting as pivots upon which the saw may be tilted. At right angles with the knobs, and at about the same distance from the center of the saw, are bolts of equal length projecting through the saw plate. One of these bolts may be simply a pin, fitting loosely in a hole in the saw plate, and its ends bearing against the collar and washer, but the other bolt has a screw thread fitting a thread in the saw plate, and has a flat-sided head to which a wrench may be applied. When the saw is placed in position on the mandrel, the outside washer is forced firmly against the ends of the bolts and knobs, by means of the outer nut, and the angle of the saw is then readily changed by turning the screw threaded bolt which engages the screw-threaded aperture in the saw-plate.

Naphtha Locomotives.

The Bellefontaine Street Railway Line, of St. Louis, have concluded to give what is known as the Connelly gas motor a fair trial. This is a motor first put into use in Elizabeth, N. J. One motor was run over six months experimentally, developed abundant power for the heaviest loads and a speed of 12 miles per hour, but there were many mechanical defects which had to be overcome. Two new motors were constructed, every improvement being tested by actual service on the road, and it is claimed that the experimental stage is now passed, and there is no longer any doubt as to the new motor's success. Preparations are being made to manufacture the motors in Chicago and Elizabeth, and possibly in St. Louis.

Upon first thought it would seem to be an easy thing to attach a gas engine to a street car, but, in fact, it has been a very difficult problem, owing to the lack of a suitable appliance for transmitting power from the engine to the car axle differentially. A gas engine geared direct to the car axle as the locomotive is connected to its driving wheels would require an engine of such bulk and power that it would be entirely impracticable. A gas engine of 25 h. p. has been applied to this purpose, geared direct, and proved an entire failure. It completely failed to start a street car on a grade or a curve. The usual mechanism furnishes direct transmission of power, but this practice conveys the least power just at the time when the greatest power is required. The most power is needed when a car is starting or on grades. It was evident that a variable transmission, permitting the engine to develop its maximum power when starting or driving a car at minimum speed, was the one essential thing needed for a gas motor. The Connelly motor is said to encompass this desirable point. An ingenious piece of mechanical workmanship is used to cover the requirement. It is called a friction device, that exerts a powerful leverage, enabling an 8 h. p. engine to easily start a loaded car on grades, which could not be started by a 30 h. p. engine connected to the axle in the common manner. The compound gas engine has high and low pressure cylinders. The fuel tank is a double cylinder, the inner one containing the naphtha and an absorbent material. This is surrounded by a jacket of water, which is connected by pipes to the water jacket about the engine cylinder. The circulation of water from the cylinder to the carbureter is continuous, and it performs a double service, cooling the cylinder of the engine and warming the naphtha, producing evaporation. Air is drawn through the absorbent material, thoroughly carbureted, and supplied to the engine, compressed, and then ignited by an electric spark. The low pressure cylinder next receives the charge and becomes a motive cylinder during the first half of the outward stroke, when, the pressure being gone, it acts as a pump, drawing a fresh charge of gas into the high pressure cylinder. The method of transmitting power from the engine to the axle is quite practicable. The main shaft is set parallel with a disk 30 in. in diameter placed on the face of the fly wheel. On the shaft is a loose friction pulley 12 in. in diameter, that engages with the face of the disk. This loose pulley is prevented from revolving on the shaft by a tongue and groove, but it is moved up or down on the shaft at the will of the driver, by means of two screw rods which pass through the pulley and revolve with the shaft.

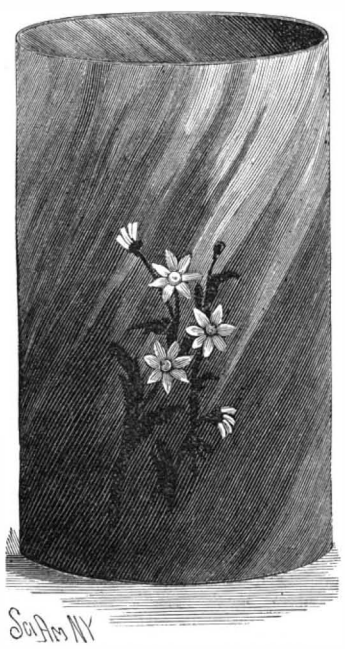
When it is required to slow up or stop, the friction pulley, still in contact with the disk, is run down to near its center, and at this point can be slightly lifted from the disk. To reverse, the friction pulley is run below the center of the disk, while the engine is left to run all the time in the same direction. The engine, it is said, requires no attention after being started, and regulates its own speed, whether the car be running or standing still. The car is started with a gentle motion and with an enormous leverage.

The cost of operating the gas motor is $1.40 per day, 14 hours, 90 miles each, while the cost of operating street cars with horses averages from $5 to $6.50 per day for each two horse car, the average mileage being 60.

The motors are now being constructed, with latest improvements, in Elizabeth, N. J.—*L., H. and Power.*

IMITATION OF MAJOLICA.

Cements and sealing wax are useful for giving to paper and wooden articles a hard glaze, resembling that of majolica ware. The cylindrical vase shown in the annexed engraving consists of a paper mailing tube 3 inches in diameter and 6 inches long, furnished with a pasteboard bottom, which is glued in. The inside and bottom of the vase is provided with two or three coats of asphaltum or shellac varnish to render it waterproof. The outside is covered with jeweler's cement of different colors, or with sealing wax, or both. The bar of cement or wax is melted at the end, and applied to the paper cylinder in the same manner as it is applied in sealing packages. No particular care is required in applying the wax. It is, however, necessary that the edges of adjoining patches of wax be brought into contact with each other to insure the complete covering of the paper. In the example shown in the engraving, olive green jeweler's cement forms the covering of the lower part of the vase. This is blended into cement colored with Venetian red or Indian red, and the cement at the top is flecked with yellow.



IMITATION OF MAJOLICA.

The mass of cement is laid on in spiral lines, and when the covering is complete, the vase is held over a smokeless flame, such as that of a Bunsen burner or alcohol lamp, or it may be held over a coal fire until the cement fuses. The vase should be turned in such a way as to cause the variously colored cements to run into each other. The vase is held by means of a paper tube or a stick inserted in its open end.

Ornamentation may be applied by cutting leaves, stems, petals, etc., from pieces of thick paper, dipping them in melted cement of appropriate color, allowing them to cool, afterward arranging them upon the vase; finally softening the cement of the vase and the ornament by holding a flame or a hot iron over them until the cement softens, and the ornaments are attached. Care is required at this point to avoid the complete fusing of the cement, as this would spoil the job. Care is also required to avoid igniting the cement or wax, as it is nearly impossible to extinguish it.

How to Prevent Scarlet Fever.

At a recent meeting of the American Pediatric Society in New York, Dr. J. Lewis Smith, the president of the society, read a paper on a part of the general discussion on "How to Prevent Diphtheria and Scarlet Fever." The micro-organism of scarlet fever had not been positively ascertained, but its effects were known from clinical observation. The contagiousness probably did not cease until after desquamation had passed, and it had been said the discharges from the otitis due to it were contagious. Quarantine in a small room attached to one of the wards at the Foundling Asylum in this city had been sufficient for scarlet fever, but not for measles. The contagious element was more fixed and less diffusible in the former. It remained in clothes a long time. Most prophylactic measures consisted in isolation of the patient, disinfection of the person and air which surrounded him, and of objects and persons in close relation with him. He called particular attention to the danger in books handled by the sick with scarlet fever, for in them the contagious element remained a long time. At his first visit he wrote a prescription for carbolic acid and oil of eucalyptus, of each one ounce; spirit of turpentine, six to eight ounces; mix, add two tablespoonfuls to a quart of water, put in a broad basin and maintain a state of constant simmering over an oil stove. He also ordered an inunction of the entire surface of the patient every three hours with carbolic acid and oil of eucalyptus, each one drachm; sweet oil, seven ounces. A solution of corrosive sublimate might with advantage be applied on a probe and cotton to the tonsils and pharynx, and ten drops of a solution of two grains to the pint syringed into the nostril every two hours in the young infant. Then there should be constant ventilation during the active period of the fever, no article should be sent from the room unless properly disinfected, new families not allowed to move into the apartments before proper disinfection, the physician should disinfect his hair and entire person, and not wear the same outer clothing when going to see midwife cases.

The Plate Glass Industry in the United States.

The growth of the plate glass industry in this country has been such that one is forced to regard its manufacture as one of the most prosperous industries in the United States. It is a question, however, one which time alone can answer, whether it will continue to be such a prosperous industry, rise being given to the question by reason of the large increase of capacity projected. There are already eight great works in operation, viz.: Crystal City, Duquesne, Creighton, Tarentum, Ford City, New Albany, Kokomo, and Butler, capable of making from 9,000,000 to 10,000,000 square feet of glass per annum, according to recent estimates, or almost as much as the present requirements of the country call for. What, then, is to become of the heavy additional production promised is not known, without lower prices for the article can greatly augment consumption. But work on new plants and additions to old ones is going on just the same, nevertheless. At Charleroi, the newest industrial city of Pennsylvania, a huge plate glass establishment is being erected, and will be equipped with glass machinery, at a contract cost of $308,000. The Diamond Plate Glass Company, of Kokomo, Ind., through a branch $2,000,000 incorporation, is putting up a works at Elwood, Ind., to make 20,000 feet of finished glass a day and to give employment to about 2,500 men. The Pittsburg Plate Glass Company propose doubling their present plant at Ford City, at any outlay of $1,750,000, so as to surpass all competitors in the matter of output, at home or abroad. Other companies still are enlarging, and entirely new enterprises of the kind are being either actually organized or talked of in various parts of the country.—*Wheeling Manufacturer.*

The First Locomotive Manufactured in South Australia.

The town of Gawler was all alive on Friday, April 11, when the first locomotive made by the enterprising firm of James Martin & Co., limited, was formally handed over to the railway commissioners. A special train left the city at 9:30, conveying a large number of the commercial world, including the premier, members of Parliament, and his Excellency Earl Kintore. On arrival visitors found the town gayly decorated. Several arches of bunting and evergreens, with a great number of flags and other decorations, gave a most pleasing appearance.

After several hours spent in looking over the works, which were in full swing, a banquet on a very liberal scale was provided. The speeches on this occasion were all well received, especially those of his Excellency, the premier's and the venerable James Martin's. Afterward, when the engine was formally handed over, a model of the regulator handle in silver and an illuminated address were presented to Mr. James Martin, and his reply evidenced how well he appreciated the thoughtfulness of his many old and new servants in making the presentation.

Before returning to the city the governor drove the engine and a number of carriages containing the Sunday school children and many residents several times up and down Murray Street, and this will be to many one of the events of their lives. Indeed, to be driven by a real live earl is the happy lot of few.

Although Messrs. James Martin & Co., limited, of Gawler, have been long and favorably known in connection with their extensive mining and agriculture manufactures; the recent substantial additions to their buildings and plant and the increase in the number of their employes is due to their having accepted the contract to supply locomotive engines to the South Australian government. The contract was signed on May 1, 1888, and provides for the supply of fifty-two locomotives, to be delivered by installments covering a period of seven years from the date of contract.—*Pictorial Australian.*

Look Out for Your Ashes.

It would appear that the cause of the accident on board the City of Paris was the breaking of the propeller shaft, which caused a sudden increase in the velocity of the engines, leading to a general smash-up. The breaking of the shaft was due to its having ground away the lignum vitæ, and ultimately the steel in the strut supporting it. It then was out of a straight line, and in consequence of this broke by the strains brought about by its own revolution. The cause of the accident is, therefore, to be traced to the grinding away of the lignum vitæ of the bearing. One theory is that the liner on the propeller shaft being too tightly shrunk on, split, thus leaving a sharp edge to grind away the lignum vitæ. Another is that the ashes which are discharged below water on the same side as the broken shaft were continuously carried to the propeller bearings as the ship was going through the water, and that they were the original cause of the mischief. —*Nautical Magazine.*

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Gas Consumption.

The business of supplying gas in this country is only in its infancy. American cities are increasing out of proportion to the general increase of population throughout the country. As evidence of this it may be stated that at the beginning of this century but three per cent of the total population were dwellers in cities. In 1880 this percentage had swelled to twenty-two per cent, and we now must have not less than thirty per cent of the whole population residents of cities and towns.

To those intimately associated with or who have followed the advances made in the manufacture of gas, the increasing value of gas works property in this country is settled beyond all question. It is now positively known that the introduction of electricity has really cut no important figure so far as to curtail the gas output, and it is well known that since the introduction of electricity for street illumination, the loss to gas companies of a few street gas lamps has in all cases been more than offset by the marked gains from increased private consumption, directly traceable to the demand for more light in order to equal the strong, high candle powers of the electric arc lights and the dazzling brilliance of the incandescent lamps.

The following shows the consumption of gas in cubic feet :

	1885.	1890.
Denver	120,000,000	210,000,000
Macon	15,000,000	37,000,000
New Albany	15,000,000	25,000,000
Des Moines	40,000,000	60,000,000
Baltimore	900,000,000	1,200,000,000
Boston	852,000,000	1,439,000,000
Cumbridge	66,000,000	120,000,000
Fall River	54,000,000	67,500,000
Lynn	40,000,000	63,000,000
Lowell	146,000,000	210,000,000
Grand Rapids	40,000,000	100,000,000
Kansas City	140,000,000	225,000,000
St. Joseph	50,000,000	70,000,000
Philadelphia	2,758,000,000	3,250,000,000
St. Louis	790,000,000	1,080,000,000
Omaha	40,000,000	150,000,000
Jersey City	160,000,000	290,000,000
Paterson	60,000,000	97,000,000
Brooklyn	510,000,000	1,250,000,000
Buffalo	95,000,000	110,000,000
New York City	2,375,000,000	8,510,000,000
Rochester	200,000,000	230,000,000
Troy	50,000,000	130,000,000
Cincinnati	730,000,000	1,000,000,000
Columbus	150,000,000	200,000,000
Providence	350,000,000	485,000,000
Nashville	90,000,000	100,000,000
Richmond	154,000,000	180,000,000

—*Progressive Age.*

Hidden Dangers in Dam Building.

In the construction of water storage dams there is an element of insecurity to be guarded against in some cases, which does not seem to have been publicly noticed. John D. Emersley, in *Mining and Scientific Press*, referring to the swelling of the ground under or near to the dam, considers it a source of danger.

A valley or wide ravine with a slight descent, and having side hills coming near to each other at its lower end, is economically favorable for water impounding purposes, provided that the collecting surfaces above are large enough to insure the supply required. In the arid regions such a valley is usually so dry that, on the side hills at least, the general water level can only be reached by deep sinking. If solid primary rock, with little permeability, is available in founding the dam, its bulk, when submerged, will not increase ; but if dependence is placed on a stratified formation containing layers of clay, talc or shale, its expansion when exposed to pressured water must certainly be expected. Every old miner has had trouble with swelling or "creeping" ground, and builders of escarpment walls are aware how hard it is to keep some kinds of rock in place during wet weather.

Assuming that a dam has been built on an unstable foundation of the kind described, what will the effect be when a pressure of 50, 70, or 100 feet of water comes upon it? The whole "country rock" above the dam will, in the center of the ravine especially, both underneath and outside of the dam building, be saturated to a great depth. Under the abutments on the converging side hills the pressure will be less, yet every pore and interstice will be filled. Should there be the slightest tendency of this water-charged rock to expand, either laterally or vertically, it is easy to understand how even a dam in itself well planned and carefully built may in time give way, owing to such expansion.

The sapping and weakening effects of water percolating under high pressure may go on for years without being noticed, but if the dam erection is ultimately, though it may be imperceptibly, lifted or compressed by the slow swelling of the ravine or hillside formations, so that cracks and veinlets are formed in or beneath it, increased pressure may suddenly destroy it.

The wearing or mechanical effects resulting from a sweating process going on in a dam, or the rock underlying it, is not the only evil which is to be feared. The air acting on wet surfaces promotes chemical changes which are followed by disintegration of the affected rocks, and thus slowly yet surely there may be destructive agencies at work where least expected.

Should there be veins of porous rock dipping under a dam from its upper side, the passage of water through such veins may of itself prove a hidden cause of disaster. The escape may be small at first, but a softening and widening work going on for years cannot fail to weaken a heavy dam building not very far above it.

If I am right, continues the author, in assuming from reasons stated above that the building of dams on some kinds of stratified rocks renders them unsafe, I trust by calling attention to the subject to encourage investigation and the adoption of adequate engineering remedies. It would be some satisfaction to know whether the Johnstown and Walnut Grove dams were built on stratified rocks. If they were, affording evidence long before they collapsed, which they did not give when first in use, that cracks had been opened in them, it is reasonable to assume that they had been injured by the expansion of the foundation and hillside rocks.

How Rubber Bulbs are Made.

It is commonly supposed by the uninitiated that the "bead," or raised line, that encircles a bulb shows the joining of the pieces of which it is made. The fact, however, is that the pieces or original parts of the bulb are invariably joined at right angles to the bead line. Long bulbs, such as syringes and atomizers, are made of two pieces; round bulbs, as pumps and balls, are made of three pieces. New and unique styles that call for variation from the established modes are daily encountered. A competent pattern maker, however, will find little difficulty, as a general thing, in so joining the parts as to secure the best results, both in vulcanizing, where the even swelling of the article must be considered, and in wear and tear, where the seams must run so as to be protected as much as possible by the general contour of the bulb.

After the pattern maker has decided by measurement and experiment upon the shape and size of the parts which go to form the bulb, zinc or galvanized iron patterns are made and given into the hands of the cutters. Mixed sheets of the required thickness being spread and afterward cut into convenient sides or squares, the bulb making begins. Each piece cut must have distinctly skived edges. Considerable care is necessary in this, as the strength of the seam depends upon the smooth fitting of the edges. The three parts for hollow balls may, however, be cut with a die. The pieces when cut are arranged in large books with leaves of smooth cloth. If the bulb has a neck, small pegs of iron are first prepared by being cemented and wound with strips of rubber as a nucleus for the neck. The two or three parts of the bulb are then brushed with cement the whole length of the skived edge, after which they are thoroughly heated.

When thoroughly warmed and softened, the bulb maker, taking a prepared peg, places the neck of one piece on one side of the rubber core, and another neck piece on the opposite side, then presses them firmly together, and rolling the whole tube-shaped piece between thumb and forefinger, has finished the neck of the bulb. The next process is that of knitting the edges which form the seam. Holding the finished neck toward him in his left hand, with the thumb and forefinger of the right he pinches the edges firmly together for nearly the whole distance round. The shape is now not unlike that of a "long clam." Into the side aperture, which is left open, is poured a little water or liquid ammonia. The opening is then made still smaller, and as a final touch the maker puts his lips to the orifice, and puffing out his cheeks till they look like miniature balloons, blows full and hard into the inside of the bulb. The softened rubber under this sudden pressure expands, the flattened shape is lost in a fuller and more rounded outline, while the operator, with a quick nip of the teeth, closes the opening, the imprisoned air and water holding the sides apart in symmetrical corpulency. There are those who can never learn the knack of blowing up a bulb with the mouth, but are obliged to use a bulb to inject the air.

After the makers have done with the now partly made bulb, it is passed to the trimmers, who, armed with scissors with curved blades, carefully circle the seams, cutting away all unevenness, till the whole exterior is smooth and ready for the mould. In front of the trimmers are a number of shallow pans partly filled with chalk. Into these the bulbs are laid. A small dumb waiter takes them down to the mould room and returns the empty pans. The bulbs on leaving the chalk pans are deposited in a small cylindrical box which, turning a few times, powders them so effectually that the rubber cannot adhere to the inside of the mould. An experienced mould worker now taking one-half of a mould in his left hand, with his right gently forces the bulb into it, capping it with the second half. If the pattern maker has done his part faithfully, each will just fit its mould. If not, they will come out of the vulcanizer wrinkled, showing that it was too large ; or, if glazed and imperfect, that it was too small.

A flat iron ring or clamp holds the two sections of the mould together when in the vulcanizer. This is tightened by iron wedges which are driven between the mould ends and the clamp. The moulds after being keyed are piled on cars that run upon small tracks into the vulcanizers, and are cured by steam heat. When the curing process is completed the vulcanizers are opened, and the cars, by a short extension of the track, are run under a simple shower bath which quickly cools them. They are then unkeyed, the moulds twisted open and the bulbs taken out. If the work be well done, the swelling of the liquid within its rubber prison has exerted so intense a force that every line and letter within the mould is reproduced upon the outside of the bulb, while the sulphur combining with the heat has sealed the copies with its magic spell.

The iron peg in the neck is next loosened by means of a blunt awl, and slipped out, leaving the bulb perfect in shape. In the mould room are large car-like boxes into which the bulbs are thrown. A box being full, it is trundled away to the cylinder room, where it undergoes a thorough scouring and polishing in huge slowly revolving cylinders.

When taken out of the cylinders, the dirty yellow color which the bulb bore on leaving the mould has wholly disappeared. It now looks smooth, white, and finished. The neck being cut off the required length by a small adjustable cutter—devised expressly for the purpose—the bulb is ready for market, or for the various fittings which accompany it as adjuncts to the syringe, atomizer, or other bulb. Where a smooth, clear-cut hole is needed in any part of the bulb, except the neck, it is cut by a swiftly revolving punch. The neck hole is left by the iron peg as already described.

A good illustration of the power of the imprisoned steam within the bulb may be obtained by knocking a clamp off a mould before it has been treated to the shower bath. The two hemispheres of iron will fly apart as if by magic, the bulb swells to treble its normal size, and explodes with a loud report. The mould workers are sometimes badly burned by hot water which bursting bulbs scatter in all directions.

A well made bulb, one that has a good, energetic spring, that has just the right smoothness of outline, that is not scarred by imperfections in the mould, and that has the whiteness of a healthy cure, is an object that always wins the respectful admiration of rubber men. Toys, balls, and hollow goods generally, are all made in the same manner as bulbs.—*India Rubber World.*

Asafœtida.

The asafœtida region is thought to include not only the whole of Southern and Eastern Persia, but also the greater part of Belochistan and Afghanistan, Turkestan, and the region, now under Russian control, eastward of the Sea of Aral. It is, we believe, cultivated in the Punjaub also, and the bulk of it, at any rate, is brought into commerce *via* Bombay, where it is received either by way of the Persian Gulf or through British India. The proportion of the drug consumed in the East is enormously larger than that shipped to Western countries. We find from the statistical tables of the trade of British India which have just been issued, that whereas the total imports of asafœtida into that country during the last five years have been 37,306 cwts., the aggregate exports have only been 2,014 cwts., or barely 5 per cent of the whole. The first trustworthy account of the collection of asafœtida in Persia was given about 200 years ago by one Engelbert Kaempfer, a German scientist ; but from the reports of recent visitors who have observed the mode of collection of the drug, this still remains the same in all essential particulars as in Kaempfer's time. According to that authority, the collection begins about the middle of April, when the earth is removed from the roots, which vary in thickness from a carrot to that of a man's leg, and the leaves of the plant are removed. Toward the end of May the top of the root is sliced away, and the juice exudes and is scraped off. A few days later another incision is made, and this process is repeated at intervals until the beginning of July, when the crop is at an end. It has been asserted that the usual asafœtida of commerce in the agglutinated tears is that which exudes from the root when the whole top is sliced off, while the tears are the solidified juice obtained from incisions only.—*Chem. and Drug.*

Kansas Railroads.

Kansas has more miles of railroads than all the New England States put together. She has 1,159 more miles than the great Empire State of New York, whose population and wealth surpasses Kansas four to one. She has more than the great States of Pennsylvania, Iowa or Texas. Kansas to-day has 8,754 miles of railroads. Illinois alone surpasses her with her 9,900 miles. Next comes Iowa with 8,364. Following her is Pennsylvania with 8,224. Then comes Texas with 8,210 miles. Only think of it! During the three years from 1886 to 1888 inclusive Kansas constructed 4,535 miles of railroads, which is more than any one of the 27 of her sister States have in operation to-day, and there are only 13 States in the Union who have a greater mileage of railroads than Kansas built in these three years.

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WALKING ON THE CEILING HEAD DOWN.

A performance of considerable scientific interest has been produced in this and other cities which is presented in the illustrations accompanying this article.* In order to procure a perfectly smooth surface to walk on, a board twenty-four and one-half feet long is suspended from the ceiling, and near one end of this is a trapeze. The lower surface of the board is painted, and is smooth and polished. The performer, who is known as Aimee, the human fly, is equipped with pneumatic attachments to the soles of her shoes. Sitting in the trapeze with her face to the audience, she draws herself upward by the arms and raises her feet until they press against the board. They adhere by atmospheric pressure. She leaves the trapeze, and hangs head downward, as shown. Taking very short steps, not over eight inches in length, she gradually walks the length of the board backward. She then slowly turns round, taking very short steps while turning, and eventually returns, still walking backward. This closes the performance.

To provide against accident a net is stretched under the board. The performer has frequently fallen, but so far no serious accident has happened. There is a certain art in managing the fall, as, if the shock were received directly by the spinal column, it might be very severe.

The attachment to the shoe is in general terms an India rubber sucker with cup-shaped adhering surface. It is a disk 4½ inches in diameter and ⅝ inch thick. To its center a stud is attached, which is perforated near the end. This stud enters a socket fastened to the sole of the shoe. The socket is also perforated transversely. A pin is passed through the apertures, securing the hold between socket and disk. The socket is under the instep and is attached to the shank of the shoe sole.

A wire loop that extends forward under the toe of the shoe is pivoted on two studs which are secured on each end of the transverse central diameter of the disk. This loop is normally held away from the disk and pressing against the shoe sole by a spring. One end of the loop projects back toward and over the rear edge of the disk. A short piece of string is secured to the India rubber and passes through a hole in the extension or rearwardly projecting arm of the loop. The disk when pressed against a smooth surface is held fast by the pressure of the atmosphere. If now the loop is pressed toward the surface to which it adheres, the string will be drawn tight and will pull the edge of the India rubber away from the board. Air will rush in, and the adhesion will cease. As each new step is taken, one disk is made to adhere by pressure, and the other is detached by the action just described.

The power of the disk to sustain the weight of a performer may be easily calculated.

Each sucker is 4½ inches in diameter, and contains therefore 16 square inches of surface. The full atmospheric pressure for the area would amount to 240 pounds. The stud and socket attachment provides a central bearing, so that the full advantage of this and of the disk is obtained, and a fairly perfect vacuum procured. As the performer only weighs about 125 pounds, there is about 115 pounds to spare with a perfect vacuum.

Electrified Wax.

Some curious electrical phenomena were lately observed (according to a writer in the *Chemische Zeitung*) in a stearin and ceresin manufactory in Italy. One evening four vats of white ceresin (which is a paraffin got from ozokerit), containing about 500 kg. each, were being stirred to cool. When the point of solidification was nearly reached, the electric light of the place accidentally went out; and, to the surprise and alarm of the rather ignorant workmen, the mass of ceresin was observed to give pale sparks on the slightest motion. If the hand was brought near, loud sparks nearly two inches long were obtained. The phenomenon lasted over half an hour.

AN ELECTRIC TRAP.

Our illustration shows a novel application of the idea of execution by electricity, by means of which it is designed to put a speedy end to rodents and all manner of noxious crawling and flying creatures. This electric trap forms the subject of an American patent recently issued to Mr. F. Scherer, a resident of Paris, France. Any suitable lure or bait is located within the cage, behind a grid composed of metal rods or

AN ELECTRIC TRAP.

wires, arranged side by side to form the positive and negative wires of the circuit. When the rat or other foredoomed victim, seeking the bait, comes in contact with the wires of the grid, the circuit is thereby closed. Of course, the current must be strong enough to produce a fatal shock, or the invention would not succeed as an electric trap.

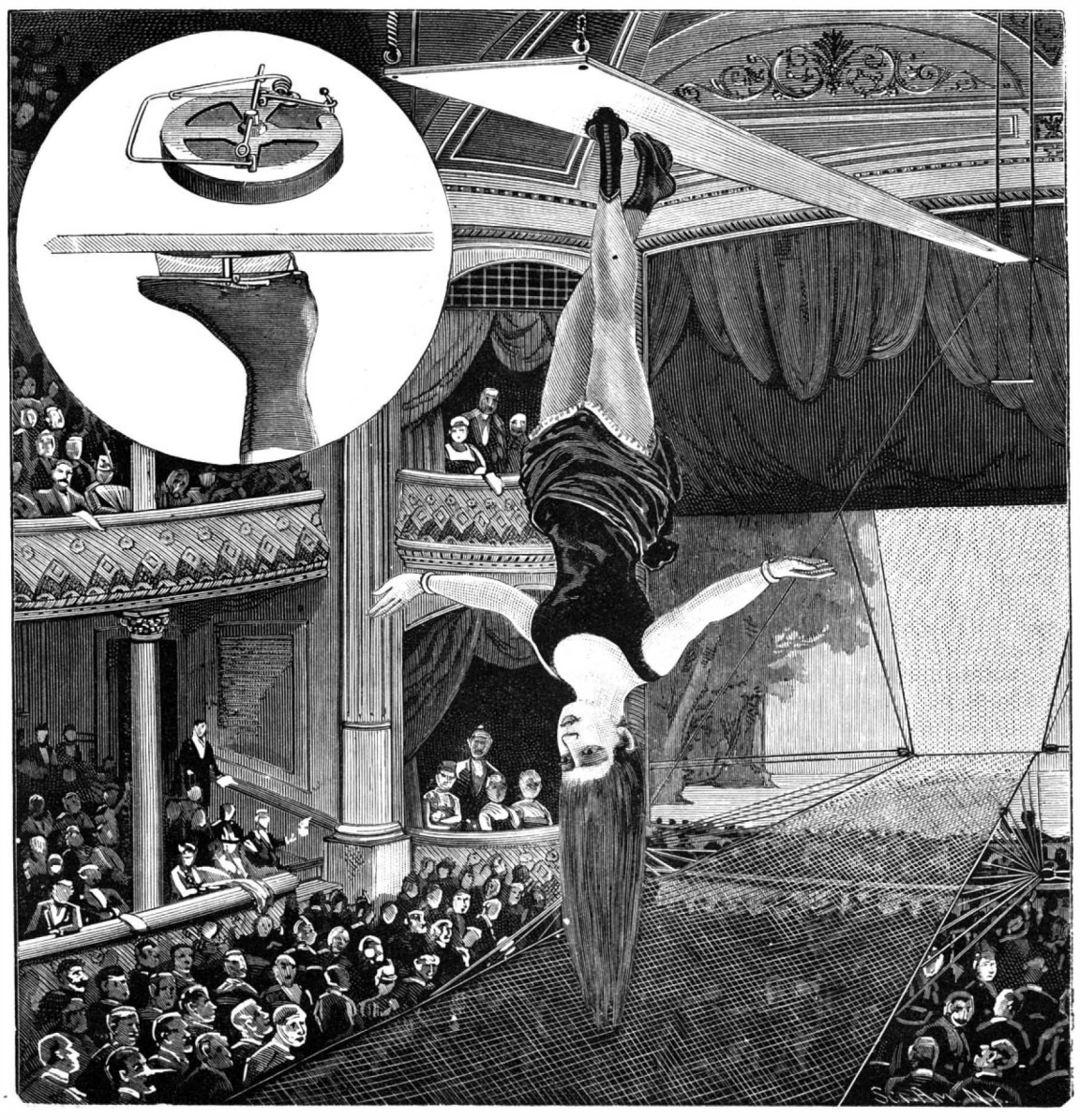
Steel Railway Ties.

The most startling piece of railroad legislation yet proposed the nation owes to that new State, Dakota. Representative Gifford, of Dakota, lately introduced in Congress a bill providing that all railroad companies shall in future substitute a homogeneous steel cross tie instead of wood, under a penalty of $1.50 for every wooden tie used five years after the passage of the act. The bill authorizes the president to appoint three persons to investigate patented metal cross ties to determine upon three of the best ties to be used. "The cost of the steel tie shall not exceed $1.50 each, and they must be so constructed as to keep the track in line and prevent the rails from spreading." The bill appropriates $75,000 for the expenses of the commissioners. We do not know of any homogeneous steel cross tie offered in this country at $1.50, but if one that can be used is made at that price by any of Mr. Gifford's constituents, they had better advertise it. They will probably be able to sell it without the help of the government. Even with the help of the government they will have a hard time getting it introduced in the place of all wooden ties within five years, unless the government undertakes to pay the cost. At a very moderate estimate these ties would cost in place as much as the entire gross earnings of the railroads of the United States for 1888, say $951,000,000. There is still another difficulty in the case. Steel ties for all the railroads of the country would take about 25,000,000 tons of steel. In the latest edition of Mr. Swank's "Directory of Iron and Steel Works," the annual capacity of the Bessemer and open-hearth furnaces of the United States is estimated at 6,800,000 tons. So if Mr. Gifford's bill passes, we shall be bothered to get steel for other uses. But perhaps it will not pass.—*Railroad Gazette.*

Fibrous Roots.

At the recent meeting of the American Association of Nurserymen, New York, Mr. Thomas Meehan said that it had been fifty years since he wrote his first article for a horticultural paper, and it seemed to him, although horticulture had made rapid advances in all of those years, that it had not progressed as far on the scientific side as it ought to have done. As a practical example of some scientific truths, upon which good practice is based, he instanced the fact that fibrous roots live only a year. They do their work and then die. Where there are a hundred small roots now about a young tree, there will be in a few years only a few large ones radiating from it, like railroads on a map. These big roots alone have the strength to send out fibers, and the root is of no value to the tree until new white fibers are growing. Therefore, it may be that a mass of fibrous roots in a tree for transplanting is injurious. They are weak, they have no vital power to put out rootlets, and they may keep the soil from contact with the big roots, which, therefore, do not find the proper medium in which to throw out feeding roots.

Another fact which observation teaches is that roots die in exact proportion to the amount of tops that are cut off. If a tree is pollarded, nine-tenths of the roots may die and then invite a fungus which spreads to the living roots. It is said that the branches which sprout from these pollards grow strongly because the roots are stronger below them, but in fact they grow from the food stored up in the trunk, just as shoots three or four feet long often grow out of logs which lie by the wayside. Generally, pollarded trees die after this operation has been frequently performed. Look, for example, at an Osage orange hedge. If one of the trees at the end is allowed to grow it will make a trunk as big as a man's body in twenty years, while the hedge plants of the same age, their vital power being weakened by constant cutting, are no larger than a man's wrist. Of course all pruning is not to be condemned, although it does weaken the vital power of the plant. We prune for other purposes than to make long-lived trees.



In the Post Office appropriation bill lately passed by the Senate is a provision by which mails are to be sorted on board steamers, so that deliveries will be hastened on arrival of vessels. The arrangement is to be in conjunction with the governments, the United States paying its portion of the costs.

* In the performance in question, the performer ascends to the top of the audience hall and walks on the ceiling head down, like a fly. The effect is very startling, and the ease with which it is apparently done is marvelous.

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THE WEAVER.

The first time that the nest of the weaver of Bengal (*Loxia Bengalensis*) is seen, it is difficult to believe that it is the work of a bird. One would call it a piece of basket work skillfully manufactured by savages, and the use of which one would have to guess at. It is a sort of tube at least three feet long, tapering upward, closed at the top and open at the bottom, and alternately inflated and contracted. This sort of bag or purse, with several compartments, is woven from a dry grass crossed and recrossed in all directions so as to form a thick fabric with close meshes. The inflated parts, two or three (sometimes four or five) in number, are chambers that are occupied by the bird. The narrow parts are passages that put the chambers in communication. The nest is suspended from the branches of the highest trees (palms, Indian figs, etc.), especially from those that overhang a river or a torrent. It thus swings in the air like a vine, and its situation, along with the fact that its aperture is at the bottom, renders it inaccessible to snakes and birds of prey.

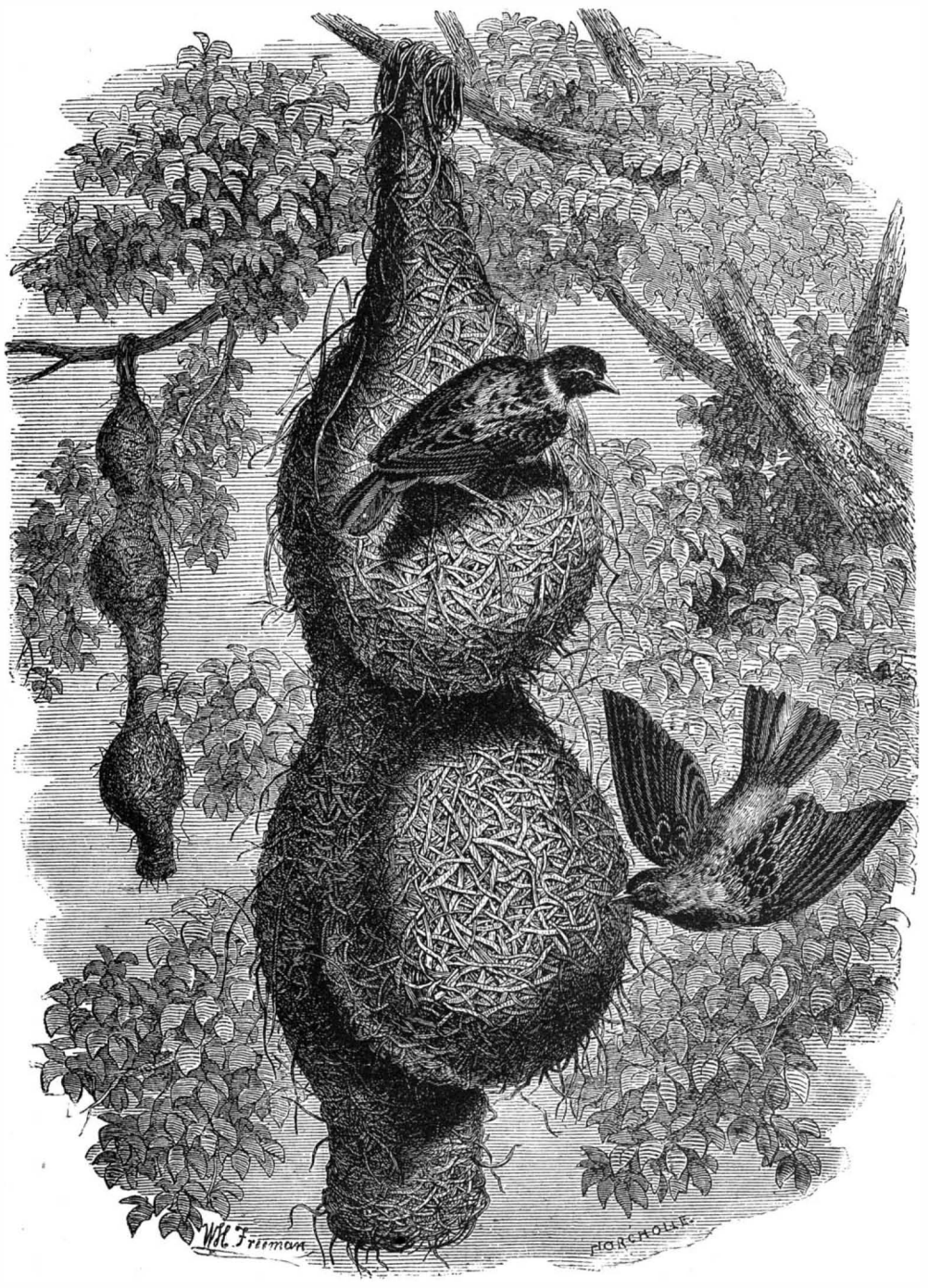
It is said that the separate chambers are so many nests successively constructed by the bird, one at the end of the other, each year; this may be so, yet it appears to us surprising that the points of junction are so completely invisible, and that there is absolutely no difference in the texture nor in the color of the materials.

The habit of weaving is absolutely innate in these birds. As soon as the nests are finished for the females who are about to sit, the males weave a nest for themselves. This has not the form of the nests destined to receive the eggs, but is an inverted cup, open at the bottom and provided with a pouch alongside of the orifice. Here the male remains and sings while his mate is sitting upon the eggs.

Another peculiarity of these nests is that glowworms are found fastened to the interior of them by means of clay. It is claimed in the Indies that these glowworms are placed there in order to serve as torches to light up the nest. According to the Hindoos, they are nuptial torches designed to guide the male through darkness to the dwelling of the female. It is probable that Oriental imagination has here given itself play, and that the worms serve rather as food than as a light for the birds. As for the presence of these insects in the nest of the weaver, there seems to us no doubt about it. As regards this, the following is the testimony of an Englishman worthy of credence who resided in India for a long time: "Wishing to ascertain for myself," says he, "what ground there was for this popular belief, I proceeded as follows: Knowing that the weavers absented themselves along about four o'clock in the afternoon, I located a person in such a way as to prevent them from returning to the nest, while I approached it. Upon opening it, I found within it a glowworm affixed to the side with a sort of clay. After sewing together the two parts of the nest, I replaced it. On the following day I again examined it, and found another and smaller glowworm in it fixed with clay alongside of the spot where the other one was found. I made the same examination of the three other nests, and in two of them I obtained the same result. In the third one, the new ball of clay was there, but I found no glowworm."

Let us add that, on the subject of the destination of these insects, the observer just cited inclines rather to the popular opinion. "It seems to me difficult to believe that the insect is put there to serve as food. Why should the trouble be taken to fix it thus to the side of the nest? The bird, moreover, is one which never leaves its nest after sunset, which loves the light, and which no one has ever seen taking food after nightfall."

The faculty of weaving nests is doubtless hereditary among these birds, but some naturalists think that imitation must also play a great role. It is certain, in fact, that great differences are to be found between the nests of the same species. This peculiarity would seem to indicate differences of talent among the various architects. It is supposed, too, that the rudest nests are the work of young or inexperienced birds.



THE WEAVER AND ITS NEST.

To color white pasteboard the color of leather, soak in solution of copperas and then in ammonia.

Professor Rucker's New "Divining Rod."

We have heard a good deal concerning the divining rod being used for finding underground supplies of water. The trick is a very ancient one, and lost nothing of its cleverness by being handed down for generations from father to son. The divining rod could find out where copper, tin, lead, zinc, or other metals lay buried below the surface of the earth, as well as discover water. The only thing that led to skepticism was that it professed to find too much. But, after all, the divining rod, made of a twig of hazel with a forked end, was perhaps the rude predecessor of the scientific instrument which Professor Rucker has just made known to the Royal Society; just as the rough Palæolithic flint instrument was the antecedent of the modern surgeon's lancet and the cavalry sword. Briefly, Professor Rucker's magnetometer is an adaptation of the well-known magnetic compass. It indicates the occurrence of subterranean strata lying beneath those which appear on the surface, if they are magnetic or contain much iron, as basaltic and many other igneous rocks do. Consequently, although this simple instrument cannot tell us if coal occurs deep down beneath, it can pronounce where it does not. In the important paper on "Coal in Southeastern England," read by Mr. William Whitaker before the Society of Arts on April 23, Mr. Whitaker had occasion to refer to Professor Rucker's recent discovery, and after the paper was read, Professor Rucker joined in the discussion. Professor Rucker and Professor Thorpe (of Leeds) have for some time past been noting the behavior of the magnetic needle in various parts of Great Britain, and they found that it frequently misbehaves; in other words, it is deflected in certain places from what would be regarded as its proper direction. The explanation is that the deflection is due to great masses of iron-bearing rocks, such as basalt, even when they are buried up beneath chalk and tertiary strata. Thus the new instrument has been the means of demonstrating hitherto unsuspected relations between the magnetic properties and geological characters of various districts. Professors Rucker and Thorpe have in this way proved that there was magnetic attraction along certain definite lines which run across England. One is from the Lynn Wash to the line of the Midland Railway between Hawes and Settle (in Yorkshire), a distance of one hundred and fifty miles. They further stated, with confidence, that a line from somewhere near the south of the Thames, running through the South Wales coal fields, was a line to which the magnet was attracted, especially near Reading. Professor Rucker is of opinion that the needle is affected by the direct magnetic properties of the underlying rocks, and this can only happen where iron is present in considerable quantities. How delicately the magnetic needle stands in relation to the iron-bearing underground rocks beneath any surface is proved by the fact that considerable effects might be produced upon it by rocks lying six or seven thousand feet below. Where such iron-bearing rocks are indicated to come up nearest the surface, coal can hardly be expected to be found; and, further, in those localities where the underlying rocks come nearest the surface, the downward pull on the magnetic needle was found to be very great.—*Sci. Gossip.*

Where Wealth has been Created.

The place above all others where the wealth, business interests, and ability of the nation have been and are being created is among the rocky hills and pleasant valleys of New England. From there have gone the money and the brains that have built up and made successful the great coal and iron industries of the Middle States, the agricultural and mineral resources of the West, and the numerous industries that are at present being developed and populating the South. It is here that began the great textile and manufacturing interests, and the iron product that has spread all over the country from the North to the South, and the East to the West. It is here that have been reared and educated the men who have made the nation, a nation that is unsurpassed in intellect, education, industry, and wealth, and it is here that are to be found to-day the great factories, workshops, and hives of industry that are the parent stock of the great family scattered broadcast over the land. Think of this. Think what it is, what an honor and a blessing to point to this little section of a great country teeming with life and industry, wealth and happiness, and be able to say, there is my home, there is my heart, and there will I place my dependence. Is such a statement of facts, backed by every truth, and open to all for confirmation, not sufficient to convince the capitalist, the laborer, the home seeker, that here in New England is everything and all that can be desired? Look where you will, to the gold fields of California, they have failed to meet the expectations and have discouraged the hearts of those who flocked to them as bees in a swarm; to the farms and ranches of Dakota, Nebraska, and the far West, they, too, have proved a delusion and a snare; to the coal and iron mines of Pennsylvania, the miners are starving and dependent; to the sunny South, the latest El Dorado of expectant wealth and future greatness, where one succeeds a hundred lose their all, and in sad reflection upon their blighted hopes and wasted energies they turn again and stretch out their arms in a longing and protesting appeal to the good old New England States, from which they went, and to which they would, like the prodigal, return, to live upon the fat of the land and enjoy the privileges and opportunities of their early days.—*The Manufacturers' Gazette.*

A RAFTING pin appears to be a very simple thing and of trifling importance, but it is not so inconsequential after all, when the number used annually is taken into consideration, and the amount of hardwood timber consumed in their production is understood. The Tittabawassee and other boom companies in Michigan use millions of these little and simple devices, one pin being required to every log "tied out" by them; and the firms producing them use up whole "train loads" of logs in their manufacture. They are simply a wedge-shaped piece of wood with sufficient of the center of the wedge removed to admit the insertion of a small sized rope, so that when they are driven into the center of each log they cover the rope and hold it firm. When the logs thus fastened in strings reach their destination, a slight blow breaks the pin, loosens the rope, and permits the logs to be handled separately. It will thus be perceived that millions of these little devices are made and destroyed annually.—*Timberman.*

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RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE. — Lincoln Hausmann, New York City. This engine has a slotted annular steam chest, an annular disk to which the piston head is attached, fitting in the slot, with a cut-off valve, in combination with levers, connecting rods, and a cam formed on the disk adapted to operate the valve mechanism, with various other novel features.

Railway Appliances.

SHIP RAILWAY CAR.—William Smith, Aberdeen, Scotland. This is a car whereon the ship is designed to be practically water-borne in such a way as to admit of the necessary flexibility of the car to enable it to accommodate itself to changes of gradient without causing undue strain on the vessel, with lateral flexibility of wheel base to admit of the car following curves of the line.

Mechanical.

AUGER.—Francis I. Hoefle, Wilmington, Ohio. The spiral body of this auger is concavo-convex wedge shape in cross section throughout its length, and formed exteriorly to a straight line through the longitudinal axis of the shank, the point of the wedge being outermost and forming the continuous knife edge, whereby the tool will pass through the article to be bored with the least possible friction, and a center will not be needed.

SCREW CUTTING DEVICE. — Henry Westbrook and Robert Burns, Woodstock, Ontario, Canada. This invention provides a new and improved screw-cutting head, which can be made in two segmental parts and hinged together to permit of opening the head for removing the bolt after the desired length of thread is cut, the device being adapted to cut a short, clean and solid thread and requiring very little driving power.

METAL ROLLING MACHINE. — Lyman White, Waterbury, Conn. This is a machine for rolling cylindrical forms of metal, providing a novel and practical manner of housing two pairs of rolls within one frame or head for rolling cylindrical forms either hollow or solid, to reduce their thickness through the entire length or at any point, or to figure, neck, flange, form joints, point or cut the same.

GIN SAW GUMMER.—Joseph E. Booker, and John O. Phillips, Raleigh, N. C. This is an improvement adapted for use in filing gin and linter saws, and designed to leave the teeth of the saw of full length and with keen points, similar to the teeth first formed upon the saw, the machine being capable of adjustment to saws of different diameters and having a steady and positive feed.

BRAIDING MACHINE.—Henry Lauferty, New York City. Combined with the race plate, carriers and braid guide, is a tubular or grooved needle supported from the center of a terminal circle of the race plate, extending at its tip into proximity to the guide, and adapted for the passage of an edge or purling thread, to form purled or raised edges in flat braided fabrics at the time of braiding the body of the fabric.

Agricultural.

GRAIN SEPARATOR. — James H. Calkins, Owosso, Mich. This is an improvement in separators having a vibratory sieve, supported by elastic arms or bars and operated by suitable connections with a crankshaft, the improvement consisting in the means for connection and adjusting the pivoted bars or frame and in adjustable stops for coacting with fixed bumper plates on the sieve frame.

Miscellaneous.

TANK.—Richard A. L. Blondel, No. 60 Hudson Street, Boston, Mass. This invention covers an improvement in discharging devices especially intended for water closet tanks, whereby the discharge or flushing valve, when opened and released, will close slowly or be retarded in its closing movement, with various other novel features and combinations of parts.

HORSE DETACHER. — George W. Harrison, Santa Anna, Texas. The whiffletree is so hinged at its rear end to the whiffletree support that the draught on the whiffletree will tend to hold it in normal position, while the whiffletree may be turned forcibly backward to reverse its trace hooks and release the traces, whereby, in case of a runaway, the horse or team may be quickly released from the whiffletree.

MILK COOLER. — Frederick Stiles, Burnet, Texas. This cooler consists of a main vessel with its upper end open and its walls drawn or inclined, a water vessel being held on such main vessel, with a space between, while an enveloping sheet is arranged to be wet by the water and extended past the space between the vessels, keeping out dust, insects, etc.

PAPER BOX.—John H. Riedell, Brooklyn, N. Y. This is a knock-down box made of two separate parts adapted to be folded and fitted together to form a complete box, the parts of the box to be folded and shipped in a flat state.

FOLDING TARGET. — Charles O. McBride, Muscatine, Iowa. The target provided by this invention is preferably made of a soft, light wood, strengthened by battens, and is designed for parlor use, with darts or javelins, the target being adjustable for height and having legs which may be compactly folded when it is not in service.

CORRUGATED STRUCTURE. — John Mitchell, Auckland, New Zealand. This invention provides a peculiar construction and arrangement of corrugated sheets upon corrugated battens to provide a solid support for the sheets to give them firmness and strength and lessen the liability of their spreading, being depressed, dinted, or shaken with the wind.

BRUSH MAKING MACHINE. — Charles D. Hughes, Brooklyn, N. Y. This is a machine designed to make a complete brush from a single block of wood, the bristles being cut out of the solid block, on which is also formed the handle, the invention consisting of a reciprocating tool holder and a block holder held beneath it and mounted to turn in conjunction with the stroke of the reciprocating tool holder.

SASH FASTENER.—Abraham C. Gandee, Racine, Ohio. This is a device by means of which the upper or lower sash can be raised or lowered to any desired position, and locked therein, or the upper sash alone can be conveniently raised or lowered, the device being simple and durable in construction and very effective.

COMBINED BELT AND SASH. — Adolph Hellenberg, New York City. This belt has a buckle to secure it around the waist, and a fastening device at each side, in combination with a sash of less length than the belt, and having at its ends complemental fastening devices to engage the fastening devices of the belt, the device to be worn in warm weather when the vest and suspenders are discarded, the sash then concealing the waistband of the pantaloons.

ROOFING FABRIC. — William H. H. Childs, Brooklyn, N. Y. This fabric consists of an upper and lower layer of paper or other material between which is interposed a layer of bituminous or other similar material, such material being unwoven, and held in place by cords, ribbons, or other filamentous material, of a thickness uniformly equal to the central layer

BED COVERING.—William T. Doremus, Flatbush, N. Y. This invention provides a bed cover having tubular parallel weighting pockets, in combination with substantially continuous flexible masses or fillings of weighting material applied to the pockets, thereby better protecting the occupant and making the covers less liable to displacement.

SAUSAGE STUFFER. — William B. Allyn, Baldwin, Wis. This is a tying attachment designed to be readily and quickly applied to any sausage stuffing machine, whereby the outer end of the skin may be held in position to retain the filling without being tied, and when the skin has been completely filled, both ends of the sausage may be tied with one knot.

COMBINATION LOCK. — Isaac Livingston, Adolph Blum, August Wollenweber, Leopold Westheimer, and Harry Cohn, of New York City. This is a keyless lock especially adapted for use with traveling bags, etc., and has a latch or keeper with a combination capable of being variously set, with idle knobs corresponding in contour with the operative knobs to puzzle those not acquainted with the lock.

STORE SERVICE RAILWAY. — Edward A. Rorke, Brooklyn, N. Y. According to this invention a horizontally swinging track is employed in connection with the dispatch track and return track, whereby a carrier may be received from the dispatch track and transferred or switched to the return track without lifting the carrier off one track and placing it on the other.

HOISTING APPARATUS. — George H. Warren, West Superior, Mich. This is a device designed to be expeditiously dropped from the shore or dock over a vessel's hatchway, and not be affected by the rise and fall of the tide, being especially adapted for use in removing merchandise and other articles from the hold of a vessel and delivering the same upon the dock or into a vehicle.

BALING PRESS. — James A. Reeder, Corinth, Miss. This is a portable press for baling hay or similar material by pressure from the front end of the press to the rear, where the compacted bale is tied and discharged, the invention providing mechanical devices whereby the follower is forced rearwardly through the hay-receiving chamber into the baling chamber, the bale being discharged through a downwardly swinging rear door.

ELEVATOR. — Charles J. Dudley, Mobile, Ala. Combined with a screw shaft having a right hand thread at one end and a left hand thread at the opposite end are pulleys or drums whose supports are engaged by the screw on opposite sides of the screw shaft, with a driving gear arranged midway between the opposite pulley supports, the arrangement facilitating a compact disposition of the parts.

OPERATING EXCAVATOR BUCKETS.—Frederick B. Barrows, Duluth, Minn. This invention consists of a carriage provided with a tail carriage, a bucket being held on a rope supported therefrom, and a bucket boom with an adjustable fulcrum, making a hoisting bucket specially designed to conveniently and automatically transfer coal, grain, and other articles from one place to another.

EGG TESTER.—Frederick and Charles Buehrig, Minier, Ill. This is a box with a cover having a series of openings to receive the eggs sidewise, a movable egg turner having openings corresponding with the cover openings, and a slight opening leading into the box, through which all of the eggs may be viewed at once as they are simultaneously turned, a tally device automatically registering the number of eggs tested.

BINDING CLIP FOR PAPERS, ETC.—Harlan H. Ballard, Pittsfield, Mass. This is a spring binding clip having no attached handles for opening it, but with apertures adapted to receive independent handles or levers, of a nippers-like construction, and by the use of which papers or documents thus held can be placed on a book shelf like an ordinary book with no objectionable protrusion from their backs.

EMBROIDERED FLOUNCED FABRIC.—Louis Loeb, Jr., Rorschach, Switzerland. This is a new article of manufacture, wherein one or more flounces are formed with an embroidered free edge and may be produced without requiring the main piece of material to be longer or wider than the finished flounced fabric, while the flounces will be safe against detachment or ripping off by wear or washing.

NEW BOOKS AND PUBLICATIONS.

ALUMINUM. Its history, occurrence, properties, metallurgy, and applications, including its alloys. By Joseph W. Richards. Second edition. Henry Carey Baird & Co. Philadelphia. Pp. xxxi, 511 (494). Price $5.

While this figures as the second edition of a well known work on aluminum already published and is due to the same author, it is really, to a great extent, a new book. It is greatly enlarged, and with a very full index forms an admirable repertory of what is known to the present day about the metal. Numerous illustrations are used where necessary, and an excellent index closes the work. Whether much or little can be predicted of the future uses of aluminum, this work may, at least, be said to give all that is known of its nature, preparation, and manipulation to the present day. The success attained by the previous much smaller edition of this work, an edition now exhausted, moved the anxiety of the public to know more about the "metal of the future." Mr. Richards in bringing up to date his original work, and his publishers in putting it into its present attractive shape, have undoubtedly ministered to a popular demand. We commend it to all interested in its subject in its many bearings, whether as regards production in the metallurgical works or general uses in the mechanical arts.

CAWKER'S AMERICAN FLOUR MILL AND GRAIN ELEVATOR DIRECTORY. Milwaukee, Wis.: Riverside Printing Company.

This is a compilation by the well known editor of the *United States Miller and Milling Engineer*, and is a book likely to prove extremely valuable for all who wish to reach and communicate directly with those engaged in the American flour and grain trade.

POOR RICHARD'S ALMANAC. G. P. Putnam's Sons. New York. Price $1.

In addition to the quaint sayings of Poor Richard, consisting of the prefaces, proverbs, and poems of Benjamin Franklin, as originally printed in Poor Richard's Almanacs, from 1733 to 1758, it contains a facsimile of the front page of one of the quaint old almanacs and a portrait of Benjamin Franklin "printer, Philadelphia, near the market."

Received.

BELLA'S BLUE BOOK. The story of an ugly woman. By Marie Calen. Translated from the German by Mrs. J. W. Davis. Illustrated. Worthington Co. publishers.

THE MORTGAGE FORECLOSED. A story of the farm. By E. H. Thayer. Belford, Clarke Co. publishers.

SCIENTIFIC AMERICAN

BUILDING EDITION.

JUNE NUMBER.—(No. 56.)

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1. Plate in colors of an elegant residence at Montclair, N. J. Munn & Co., architects, New York. Perspective view, also a plate showing the north and rear sides, floor plans, sheet of details, etc.
2. Elegant colored photographic plate, with floor plans, sheet of details, etc., of a cottage at Blythebourne, L. I. Estimated cost $3,200.
3. Residence at Yonkers, N. Y. Perspective view and floor plans. D. & J. Jardine, architects, New York. Cost, $10,950.
4. A residence at Orange, N. J. Perspective views, floor plans, etc. Cost about $12,000.
5. Perspective view and floor plans of a residence at Holyoke, Mass. L. B. White, Holyoke, Mass., architect. Cost complete, $6,000.
6. Sketch of two old Bristol houses.
7. Sketch of hotel and Post Office, Dartmouth.
8. A casino erected at Springfield, Mass. Cost complete $12,000. Floor plan and perspective.
9. A church recently erected at Greenwich, Conn., at a cost of $13,000 complete. J. C. Cady, architect, New York. Ground plan and perspective elevation.
10. View of the entrance to the United States Trust Company's building, Wall Street, New York.
11. A dwelling at Yonkers, N. Y. Cost complete $5,000. Floor plans and perspective elevation.
12. Elegant residence at Stamford, Conn. W. R. Briggs, architect, Stamford, Conn. Cost $15.000. Floor plans and perspective.
13. View of the iron and wood gate in front of the entrance to the Press Pavilion at the recent Paris exposition.
14. Miscellaneous Contents: Fireproofing wooden floors.—"Peach bottom" slate.—The manufacture of granite. — The lien law.—Combustible architecture.—Variety in Gothic architecture.—New No. 9 double cylinder planer and smoother, illustrated.—A sliding Venetian blind, illustrated.—The Holmes spur feed slitting machine, illustrated.—Get sound titles to your real estate.—Heating apparatus for a wagon factory.

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Fruit Evaporators. Trescott Mfg. Co., Fairport, N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J

For best hoisting engine. J. S. Mundy, Newark, N. J.

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Best Ice and Refrigerating Machines made by David Boyle, Chicago, Ill. 155 machines in satisfactory use.

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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Minerals sent for examination should be distinctly marked or labeled.

(2301) Pasadena asks how to crystallize small fruits of all kinds. A. The following process may meet your requirements. Make a sirup from a pound of sugar and a half pint of water, stir until the sugar is dissolved, then boil quickly about three or four minutes. Try by dipping a little in cold water. If it forms a small ball when rolled between the thumb and finger, it has attained the desired degree, known as the "ball." Throw the fruit to be conserved a little at a time into this sirup, let it simmer for a moment, lift with a skimmer, draining free from all sirup. Sprinkle sugar thickly over boards or tin pans, place the fruit over it in a single layer, sprinkle over thickly with granulated sugar and place in the oven or sun to dry. When dry, make a sirup as before, and just before it reaches the "ball" degree add the fruit, stir with a wooden spoon until it begins to grain and sticks to the fruit. When cold, sift off the sugar and put out again to dry. When dry, place in boxes in layers between sheets of waxed paper. Keep in a cool, dry place.

(2302) J. M. A. writes: I made a large plunge battery described in Hopkins' "Experimental Science," and I used bichromate of soda for exciting fluid, and the current it produced became so hot as to burn the wire and insulation. I then tried bichromate of potash, with no better results. Please tell me the cause of its getting hot and how I can remedy it. I made the battery according to directions, and also the solution. Does the size of wire have anything to do with it heating, if so let me know the kind to use. A. Your trouble lies in your wire. It is too small. Use No. 12 or 14. The heating of the wire and burning of the insulation indicates that your battery is a success.

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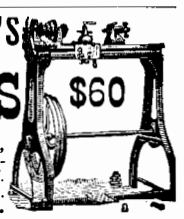

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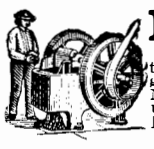

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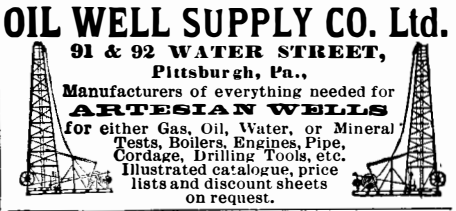

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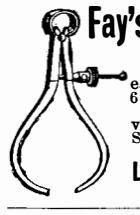

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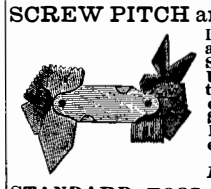

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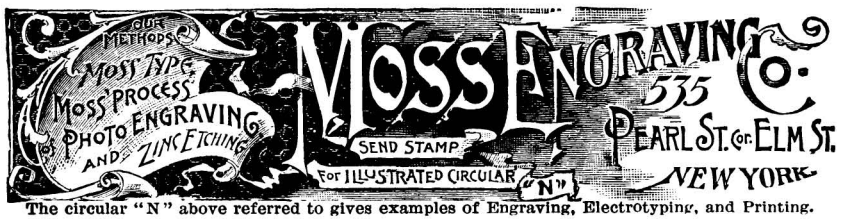

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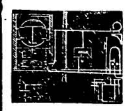

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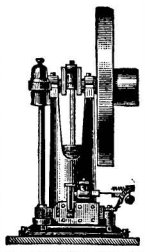

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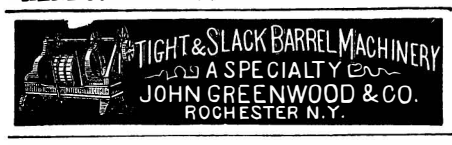

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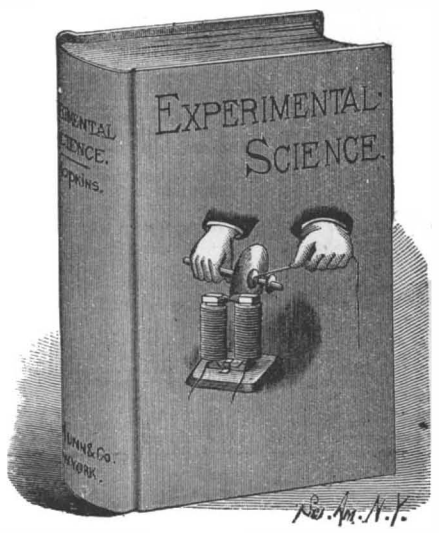

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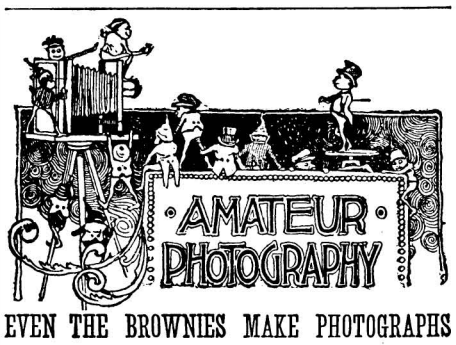

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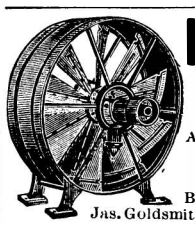

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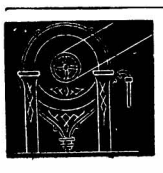

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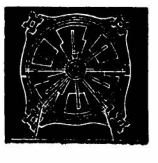

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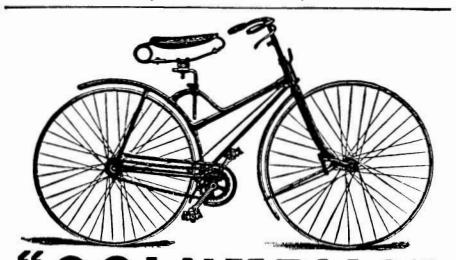

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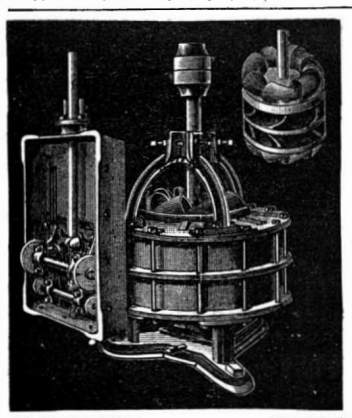

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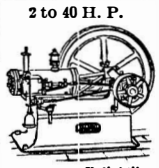

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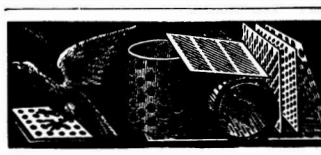

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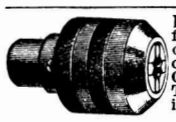

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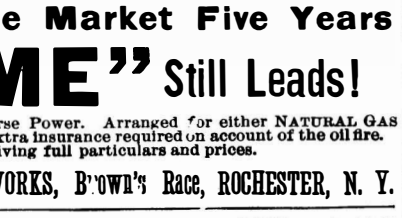

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